Examining Design Management in the Era of Digitalization from Eastern and Western Perspectives

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A thesis submitted for the degree of Doctor of Philosophy
Lancaster Institute for the Contemporary Arts, Lancaster University

December 2015

Abstract

This thesis investigates how approaches to managing design differ nationally in new product development and design for digital technology-embedded product and service. The main aim of this thesis is, first, to understand different approaches to managing design in terms of Eastern and Western organizational cultures: second, how these differences affect actual design practices and design outcomes in increasingly complicated digital technology-embedded product development and design. Currently, design principles for digital products and services are shifting towards incrementally uncertain complexities and the role of design is becoming broader in the era of digitalization. New approaches to design management in organizations are considered in this context: more specifically, design for digital technology-embedded products and services entails generative design practices as these digital artefacts as a whole are accomplished by devising both a physical materiality and immaterial objects such as services and software with multiple design participants. Through the design process, meanings of the digital artefacts are constantly generated and recreated. For that reason, the design practices are considered about holistic approaches to embrace such generativity. In relation to this, the organizational environment needed to deal with this requires many different approaches in order to embrace the new design practices. This is concerned with *enabling* rather than *controlling*, as has been done in traditional organization environments. However, looking at actual organizational vocabularies used in design practices, there is significant inertia with organizational cultures that can harness or enable these approaches.

Taking into account cross-cultural perspectives, the features of organizational vocabularies probably differ in different organizational cultures in East Asia (South Korea, Japan, and Chinese cultural background countries) and those of the West (US, UK, Finland and Netherlands)[1]. East Asian organizations' features are characterized as *control* and *governance* in tightly coupled and hierarchical organizational cultures, whereas Western organizations are more likely to feature *enabling* or even *indulgence* in loosely coupled cultures. These can affect actual approaches to design management in the implementation of digital innovation.

A qualitative dominant-mixed method research approach is used in this research for multiple case studies: 29 design professionals, ranging from engineering and marketing to design, from across the globe participated in expert interviews in two phases of this research. Quantitative secondary data sources were investigated in support of the qualitative data sources (+150 secondary data sources: corporate documents – earnings and annual reports; and public reports on national creativity, innovation and industry ecosystems).

[1] This will be explained in Section 2.3.4 and further in Section 3.2.2

The research findings illustrate different approaches to managing design in the East and West due to their organizational cultures: namely, the East is characterised as inflexible approaches towards completed design output, whereas the West prioritizes a flexible journey expecting design outcomes. This however causes dilemmatic conflicts in carrying out the generative design practices for creating new digital products and services within those organizations.

This thesis suggests a matrix of organizational cultures for managing design and the two design management paradigms in the implementation of digital innovation in organizations: the 'design of management' vs. the 'management through design'. This study provides an understanding of emergent issues about organizational environments with regards to approaches to managing design in digitalization from international and cross-cultural perspectives and will clarify the concept of the new approaches to design in digital innovation: designing. It will make a contribution to development of design management as a rigorous discipline, which can be applied to design practices for innovative organizations in the era of digitalization.

Acknowledgements

First of all, I would like to express that I appreciate my family's immense contributions to my achievement. I am gratefully thankful for my parents' dedicated support and patience through every step of this journey. Despite such long distance between us, your encouragements to me and constantly looking after me can help me arrive at this end. And also, my younger brother's fun, joke and his remarkable outcome, my new born nephew always makes me smile and be joyful in this journey.

I owe a lot to all of my current supervisors, Professor Rachel Cooper and Dr Emmanuel Tsekleves, and previous supervisors, Dr Emma Murphy and Dr Sabine Junginger, for their constant and dedicated supports and, most importantly, for providing inspirations.

I appreciate Professor Rachel Cooper as she always leads me to right direction and drawing the big picture of my research by providing freedom of my research and confidence based on her experience and insight. Dr Emmanuel Tsekleves always shows me his dedicated supports and put his efforts for me to accomplish my research with his humble mind and broad insight, despite his busy and tight schedule. His insightful reviews and comments on my papers and research are always helpful for my research to improve. I would also like to thank Dr Emma Murphy for her warmth and kindness during her PhD supervision with me. Thank to her great efforts, I could obtain my great opportunity, 2013/14 RADMA doctorate studies award in the UK and this must be one of the great achievement of my PhD journey. And most importantly, I would like to express my thankfulness to Dr Sabine Junginger because she invited me to this joyful journey. Only she caught my research ideas and thoughts when I who used to be a normal salary man at a large company in Korea explored of my PhD opportunities a few years ago. Her academic knowledge and insights about design and organization help me open up my eyes to these possibilities in the academic world. I really thank all of you for your supports.

I must gratefully acknowledge the financial support of my research by Research and Development (RADMA), which I received from them.
I should also extend my thanks to all of the research participants for making their time for me who am a stranger to them to interview with them. Since their insightful answers based on their own experiences about design projects with global tech companies this thesis is believed to be more invaluable and will be useful for future researchers and practitioners who are interested in design and innovation.
And I hope to express my special thankfulness for digital technology itself as frequent and constant contacts with my family with all kinds of digital technology applications can help me focus on my studies with little concerns about my family and no homesickness. Also, it obviously inspires me to study my research and opens my eyes.

Lastly, thank you for all of my friends and acquaintances who I have met in the whole of the UK including Lancaster during my PhD journey. I believe the talks with my friends and the unique ambiences of the UK must create this outcome.

Thank you all.

Declaration

I declare that this thesis is my own work. Except for commonly understood terms, accepted ideas, or where specific reference is made in the text, this thesis does not contain any materials or research outcomes that were previously published or written by another person. No part of this thesis has been previously submitted to any university for the awards of a higher degree, diploma or other qualification in substantially the same form.

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December 2015

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1.1. The Shifting Meaning of Design in Organizations in Digital Innovation

1.1.1. The New Meaning of Design: Designing

Approaches to managing design in organizations need to be reconsidered as design principles that are applied to digitalizing product and service design are different from traditional design principles. Designing of digitalizing artefacts is faced with constantly changing 'uncertainty' and it contains increasingly complicated 'heterogeneous' design elements in the knowledge creation domains (Lyytinen, et al., 2015; Yoo, et al., 2012). To discuss this, it is central to understand a nuanced relationship between product, design and organization in managing these elements first.

Product design is a vital asset for an organization because the organization can sustain its business by meeting market demand with certain volumes of standardized products. In accomplishing the design practices, organizations can reduce varying levels of unprecedented uncertainty surrounding the organization (Yoo et al., 2006; Weick, 2004). New products are produced to obtain new opportunities from uncertain situations and so it is necessarily considered to be a central organizational managerial issue (Boland & Collopy, 2004; Simon, 1996). New product design has, therefore, been an organization's competitive asset (Karjalainen & Snelders, 2010). However, currently the terms 'design' and 'product' hold nuanced meaning and design practices have come to cover all relevant material and immaterial aspects of the terms. The central assumption is that all material practices associated with an individual's ongoing daily life are situated in continuously changing problematic situations (Simon, 1996; Garud et al., 2008).

In the twentieth century – represented by Taylor's (1911) scientific management and the rational system of organizational management model – the earlier emphasis of organizational approaches to product design was in line with efficient manufacturing that aimed to maximize production lines and reduce the uncertainties emerging from markets and technology (Thompson, 1965; Scott, 1998). A new product was designed under one single hierarchical organization's tightly coupled governance for its single hierarchically manufactured and engineered products (Gawer, 2009; Yoo et al., 2010). Product design was therefore addressed through consideration of improving and diversifying physical aesthetics, features and functions, which could expand product lines and variation to enhance one

organization's market achievement (Monö, 1997; Heskett, 1980).

In contrast, much current literature on digital technology-embedded products and services or digitalizing artefacts, (such as smart devices: iPhone, iPad, Kindle, Galaxy series, Facebook, Google, Amazon etc.) discusses *digital innovation* and the impact of *digitalization* in *sociotechnical contexts*. Design practices are considered differently - as the concept of the material in an era of digitalization differs from that of more traditional approaches.

These digital technology-embedded products and services show different characteristics in terms of the definition of the materiality. In these artefacts, physical things that can be *tangibly* sensed are incorporated and interwoven with *intangible* software and the embedded digital technology is reprogrammable using homogeneous types of digitizing data (data in bits of 0 and 1) (Yoo et al., 2012; Yoo et al., 2010; Tilson et al., 2010). The functional properties of these digitalized artefacts are therefore reconstructed and accomplished through enormous *heterogeneities* across the layers that constitute into one digital device, consisting of physical devices, networks, services and contents (Yoo et al., 2010; Yoo et al., 2006). This materiality, incorporating tangible hardware and intangible software applying digital technology, is referred to as *digital materiality* (Yoo et al., 2012).

It is, therefore, not limited to the fixed boundary of meaning of a physical artefact, such as a telephone for voice calling only. Yet the meaning in the material can be manipulated by converging those digital technologies, generating a new meaning of digital materiality depending on how/what users or designers want to experience with the artefact: for instance, smartphones can afford voice call, games, video filming, e-books etc. So, users and designers can create new meaning with one single device by adding or creating software or hardware applications.

In this sense, the concept of digitalization is introduced to account for practices for digital materiality. Tilson (2010) and his working group clarify the meaning of *digitalization* and *digitizing*, helping to explain the nuanced meaning of design practices in an era of digitalization. *Digitizing* is referred to as a technical process that converts analog signals into a digital form, whereas *digitalizatio**n*** is a *sociotechnical process* of applying digitizing techniques to broader social and institutional contexts, which accounts for digital technologies infrastructures. It is specifically based on the *loose-coupled* and *decentralized* information technologies techniques and organizational structures. Thus, the meaning of digitalization is not only limited to the existing boundary of technological knowledge and organizational issues but it is also necessarily considered in respect to global, national and regional industry and corporate structure, which all support or enable the digital infrastructure (Tilson et al., 2010; Yoo et al., 2010).

Considering the characteristics of digital materiality in the era of digitalization, the new approaches to the digitalizing artefacts entail *openness* as the fundamental property of digital artefacts, which are simply characterized by *generativity* and *convergence* in creating new digital artefacts and design practices (Yoo et al., 2010; Krippendorff, 2011; Yoo et al., 2012). The design practices in digitalization are considered as *evolutionary and generative practices implying holistic design*. And so,

the emphasis of those design practices is focused on *generating new meanings* with given artefacts, rather than refining, modifying and assembling a fixed and stable meaning of existing tangible materiality (Verganti, 2008; Yoo et al., 2010; Krippendorff, 2011).

The concept of *designing* is distinguished from that of *design*. Designing implies a verb, whereas *design* is a noun. It is especially true that design practices for digital materiality represent *designing* because design practices for digital materiality are underlined by a status of *incompleteness* towards *complete outcomes* due to its generative and convergent nature of digital technology. The design practices are rather characterized as continuing responses towards changing, *ill-defined, problematic human situations*, and the design process is featured in consecutively conceptualizing and structuralizing processes for those digital artefacts (Garud et al., 2008). In accordance with the principles of digitalization, the impacts of designing for digitalizing artefacts are explicitly and implicitly seen in the transformation of all sociotechnical circumstances, from products to design, distribution, production, prices, and even at the firm level (Krippendorff, 2011). Those new approaches, characterized as convergence and generativity towards digital materiality, combine heterogeneity and recreate new meaning in the material practices; therefore, this leads to *digital innovation* in creating novel products and services by affecting all those heterogeneous elements constituting digital materiality (Yoo et al., 2010).

1.1.2. The Shifting Logics of Organization for Digital Materiality

In the era of digitalization, shifts in the principles of product and service design are required of the different logics and approaches to design management in organizations in creating digitalizing artefacts. This is because, as noted above, digital technology *per se* is situated in unprecedented changes and generative evolution: ill-defined uncertainties. Therefore, organizations should consider *agility, adaption, and ambidexterity* to embrace uncertainty by tailoring their strategies and approaches in managing digitalizing artefact design, as concerned with heterogeneity underlined in digital materiality. The conventional organizations' top-down management style, which has been used for traditional product and service design, is not easily applied to approaches to managing new digital technology-embedded product and service (Reeves et al., 2015). In fact, organizations have been most likely configured and designed by interacting with the logics of product design. The organizational logics with product design have been addressed in objectified, stable and precedent predictability-based rationality for the most competitive operation (Yoo et al., 2006; Weick, 2004). The organization structure has been also characterized as a centralized model that is a vertically integrated single hierarchical type for efficiently maximizing its profits with its single hierarchical product (Yoo et al., 2010; Cross, 2008; Mintzberg, 1983). In this sense, traditional principles of design have been, to some

extent, featured in reductionist approaches, so as to meet the tightly coupled and single hierarchical product architecture of those organization structures. The earlier approaches to product and service design emphasized physical aspects, such as functions, physical features, design as styling and looks, in accordance with traditional design principles (Karjalainen & Snelders, 2010; Person et al., 2008; Monö, 1997), and so the roles of an organization in the design process are somehow fixed to these kinds of physical design tasks (Yoo et al., 2010).

However, new approaches to design practices in digitalization should be considered as holistic approaches; they address many contextual and sociotechnical features beyond simple physical looks (Krippendorff, 1989; Krippendorff, 2006). *Designing* entails *openness and generative design practices* in evolutionary approaches between the structured and unstructured (Garud et al., 2008; Giddens, 1979). Organizations that deal with design practices for products and services are not only limited within a boundary of *homogeneous* groups or a relevant industry unit, but they are also expanded into heterogeneous communities/groups beyond a fixed boundary of industry for creating new meanings for digital artefacts, interacting with heterogeneous types of knowledge derived from diverse design participants (Yoo et al., 2010; Gawer, 2009; Sanchez & Mahoney, 1996). The approaches led by heterogeneous types of design participants can come closer to a concept of *innovation*, as the concept of *designing* entails surrounding environments in holistic approaches, whereby practices are things combined between adoption and diffusion driven by both end-users and those institutions in the market and technological introduction (Abernathy & Clark, 1985).
To sum up, organizational approaches to managing design in the era of digitalization are concerned with how heterogeneities create new artefacts. Organizations should reconsider their traditional logic towards single hierarchical, fixed, stable and homogeneous types of material practices and their organizational structures that fit those materials. Considering that shifts in organization logic can constantly generate new meanings for their products and services, this can contribute to sustaining competitive business with their products and services in the era of digitalization.

1.1.3. Conflict Emergence in Creating Digital Materials in Organizations

The dynamics of digitalization in organizations, however, can cause significant conflict between organizational approaches to managing design. Looking at actual domains of design practices, i.e., organizations, the issues derived from the dynamics are seen as highly critical aspects. Approaches to managing design that characterize digital technology-embedded product and service are undertaken with prominently different design languages: *generativity*. This implies openness, as opposed to traditional approaches to managing design in organizations, namely, tensions between controlling vs. openness. On the other hand, there can be also said to be a conflict between conventional

organizations' focus on controlling approaches vs. the enabling that openness-driven organizations should consider. The major reason why conflict occurs is the concept of *openness,* which conceives tensions as unprecedented ambiguities, uncertainties and risks.
In fact, discussions regarding tensions, resulting from openness in approaches to design and material practices, have been critically discussed in innovation, platform strategy and organization studies, which focus on the nature of innovative and complexities, in accordance with theories about *design rules.* The discussions based on complexities, modularity, structures, economic contexts and the manners of the operation in organizations (Baldwin & Clark, 2000) include: conflicts between *controlling; governance; inflexibility* and *enabling; flexibility*: tensions between flexibility for innovativeness and inflexibility for efficiency (Hlavacek & Thompson, 1973); paradoxes of corporate governance between control and collaborative approaches (Sundaramurthy & Lewis, 2003); interdependent and contradictory relationships between changes and stability in a change of organizational system (Farjoun, 2010); paradoxical relationship between *control* and *generativity* of innovation in digital ecosystem (Eaton et al., 2011); raising an agenda on the paradoxes of change and control in salient digital infrastructures in the area of information systems research (Tilson et al., 2010).

In particular, those critical discussions are clearly reflected in design practices for digitalizing artefacts (i.e., designing), as this necessarily takes place in unprecedented uncertainties. For its generative design process, designing is concerned with an ill-defined separation between texts and contexts that responds to continually changing and dynamic problematic worlds in digital materiality (Garud et al., 2008). In this digitized context, therefore, approaches to managing design between organizations are not easily addressed in fixed and stabilized concepts with controlling-led organizational approaches. Explorative, tacit and implicit approaches to uncertainties in those design practices should be significantly underlined rather than exploitative techniques and strategies in organizations.

1.1.4. The Necessities of Studying International Design Management: the East and the West

The emerging conflicts between traditional design approaches and newer one in digitalization are differently reflected amongst organizations as interpretations regarding the newer design approach, designing in digitalization can be differently made, and the perception to uncertainties that designing conceives could be different in creating new digitalizing product and service.
For instance, the global lawsuit claims over product design patents between Samsung from South Korea and Apple from the US (since April, 2011) is a relevant case as it is caused by organizational confusion concerning designing. The case tells us that conventional discussions on traditional design

principles, emphasizing physical looks and features, has become diluted, and approaches to design management should be viewed from contextual perspectives: in other words, how design practices have been undertaken in actual domains and how it has been affected by the contexts. In this case, both Samsung and Apple claimed patent issues with each other, not only at the physical device level, such as the product's physical shape and features, but also at the intangible service level: e.g., interaction design. However, because of digital materiality, there is not much room to differentiate one tangible product design from another through physical design principles, e.g., changes of shapes, or of modular key pad etc. (Hwangbo, 2013; Banks, 2012). It suggests that design issues in digitalization cannot be only addressed in physical design issues. Yet it is also closely interlinked with sociotechnical contexts. Organizational contexts surrounding the design practices are therefore significantly underlined. In particular, digital technology-embedded products and services are designed neither by one single individual designer, nor solely one advanced company. It is globally co-created within a digital ecosystem. For instance, Apple products are developed and designed by over 200 global suppliers and platform complements across the world, from Guangdong, China in East Asia to Alabama, in North America, based on Apple's digital platform in partnership even with its competitors, including Samsung (Apple, 2014; Gawer & Cusumano, 2013). Therefore, it is imperative to develop far deeper understanding of the sociotechnical impacts on levels of industry, markets, organizations, nations and the international contexts in studies on digitalization (Tilson et al., 2010; Yoo et al., 2012).

The author, therefore, argues that conflicts in design management in digitalization should be viewed from the perspective of implicit organization level: that is, organizational cultures concerned with inherent collective norms and values of organizations in creating digitalizing artefacts. Despite the controversy over issues of physical similarities of their product design, Samsung and Apple's products and services are designed and developed in prominently different organizational contexts, as these two companies originate from different sociotechnical backgrounds – East Asia and the West – which can result in different approaches to immaterial and material systems.

Organizational cultures derived from those material realms at a national level can significantly affect new product and service development and design. This has been discussed in relevant literatures, such as management science, marketing and product development. Accordingly, different organizational cultures in the East and the West can have significant impact on strategic decisions in New Product Development (NPD) processes (Lee et al., 2000; Nakata & Sivakumar., 1996; Song & Parry, 1997), as well as all international business, despite the movement towards globalization (Hofstede, 1994; Hofstede et al., 2010; Brett et al., 2006).

In contrast, design management studies have tended to overlook those sociotechnical contexts related to organizations and nations, involving technology and dynamics of international business circumstances. In fact, design management as a discipline has been challenged because of its lack of a consensus and inconsistency of the application of design management in practice at design industry

level (Sun, et al., 2011; Cooper, et al., 2013; Best, 2006). Although design management as a discipline has been studied empirically with diverse focuses across different design disciplines, the scopes of scholarly literatures have not been shown consistency. It has dealt with limited areas of design management such managing physical design contexts: e.g. a manufacturing context, construction projects, fashion industry; or replicated its studies to relevant design disciplines such as service design and retail design etc. (Sun, et al., 2011). Moreover, those studies are considered neither the sociotechnical contexts nor actual organizations at design industry level and rather addressed within limited traditional design management issues such as recognition of the features of products: 'styling' or 'branding in an organizational perspective (e.g., Karjalainen, 2003; Karjalainen & Snelders, 2010; Person, Schoormans, Snelders & Karjalainen, 2008; Verganti, 2008). Accordingly, design management studies do not discuss the dilemmatic confusions between openness and controlling in the era of digitalization, from international and cross-cultural perspectives.

In this context, this thesis will attempt to articulate the concept of design management and rebuild the approaches to the study in order to respond to the era of digitalization and digital innovation. This is aimed at bringing new understandings of design management. But it rather focuses onto providing explanations about approaches to 'managing design' for dealing with 'digital materiality'; not limited within a boundary of design management studies as considered that there has not existed a single agreed definition of 'design management' (Sun, et al., 2011; Best, 2006).

This thesis is rather focused on the terminological meaning of 'design', 'management' and 'organization', rather than applying a specific root in the existing design management study literature. The articulated concepts of design management in digitalization will be presented in chapter 7 of this thesis as new suggestions for future design management studies. This will be considered about a trajectory of evolution of design practices.

1.2. Thesis Aim, Research Objectives and Questions

This research was initiated to illustrate different organizational approaches to design management in the era of digitalization. This thesis studies organizational cultures, and particularly organizational values and norms in design practices that are reflected in new product development and design projects, from cross-cultural perspectives, namely, those of the East and the West.

Looking at the significance of new studies on design management and organizations in digital transformations, causing shifts in the design principles and logic of organizations, it is necessary to consider several missing agendas: how approaches to design practices for digitalizing artefacts differ in 'actual' organizations; how organizations implicitly confront the challenges to creating new product and services in the era of digitalization; and how new approaches to design management in digitalization are hindered or enabled.

In design management studies, there have been however few considerations regarding such organizational contexts in the macro perspectives, such as nations, industry and organizations. Alex Williams and his colleagues have raised this issue by suggesting a theoretical design management framework in a cross-comparative perspective at industry level: design management contexts in the UK and China (Sun, et al., 2011; see also Cooper, et al., 2013).

However, to understand this more, this study looks into organizational cultures from cross-cultural and international perspectives (the East and West) and the approaches of actual organizations to design management in digital innovation. This will result in far deeper understanding about implicitly conceived issues in design management and organizations that lie in digitalization and the design practices. It can draw upon significant features of actual organizations that affect approaches to design management in 'actual' design practices in this digital transformation.

In particular, comparing organizational cultures in the East and the West will help draw attention to actual organizational languages and vocabularies in design practices. Despite globalization, the gap in organizational languages between the East and West still exists and has been critically considered in discussions on organizations' purposeful material practices in scholarly literatures and amongst practitioners: Eastern organizations, e.g., South Korea, Japan and countries of a Chinese cultural background, use 'controlling' and 'exploitative' organizational language towards maximized 'efficiency' under tightly-coupled, single hierarchical organization structures; whereas the West, e.g., the U.S. the U.K. and the Netherlands, is 'less- controlling' and 'explorative' in loosely-coupled organization structures (Hobday, 1995; Hofstede 1986, 1994; Hofstede & Bond, 1988; Hofstede et al., 2010).

Therefore, this study will identify key issues about how approaches to managing holistic design for digitalizing artefacts are hindered or enabled in those contradictory organizational contexts. At the same time, this thesis brings a key lens, through which readers can view dilemmatic challenges that real organizations face between openness and controlling in designing. This study is, therefore, imperative in design management studies, as it initiates understanding of the contextual issues that arise from digital transformation.

This thesis will offer key understandings of actual design practices and organizational concerns in design management in the era of digitalization, by taking cross-cultural perspectives. In line with this, the study is not aimed at theoretical saturation, but is rather focused on opening new perspectives; building and suggesting new theories, considering relations between design management and organizations in the era of digitalization. These will be undertaken in accordance with the following research aim, objectives and questions:

- **Research aim:** To identify how approaches to digital product design differ nationally by examining organizational cultures in the East and the West.

- **Research objectives**
  1. To understand from the existing literature how national cultures influence individual organizational cultures, and hence their cultural norms and values.
  2. To identify how the norms and values (attitudes) of an organization influences approaches to creating new products, in particular new products that embed digital technology (digital, new products).
  3. To examine how the norms and values of creating new digital products impacts specifically on the product design process throughout the NPD process.
  4. To examine how the norms and values in designing new products in these organizations is reflected in the resulting digital, new product
  5. To develop a theoretical model of different organizational cultures and their attitudes towards design.

- **Research questions**
  1. Do national/cultural differences influence individual organizational cultures?
  2. Does the organizational culture influence the new digital product design in the organization?
  3. How does the organizational culture influence new digital product design and development?
  4. How is the organizational culture reflected in the resulting digital product design?

1.3. The Thesis Structure

This thesis began by exploring the research background and significance of this study. The thesis for this research will be conceptualized and structured as follows:

- **Chapter 1** addresses the basic understanding regarding relations between design and organizational cultures, looking at the shifting meaning of design and the necessity of learning about organizational cultures in the era of digitalization. This was the basis for the research aim, research objective and questions for this study.
- **Chapter 2** addresses the relationship between design, organization and organizational cultures with scholarly and theoretical discussions. This will be explored in a range of design epistemology shared in both design and organizational studies. The discussion will arrive at an understanding of *evolutionary* perspectives of design and organization studies, and it will

lead us to a new understanding of approaches to managing design, showing that organizational artefacts (products) can differ in particular organizational contexts: i.e., organizational cultures. These differences can be clearly identified in prominently different organizational cultures in the East and West. For a better understanding of this study, the research domain is chosen i.e., new digital product development, which can represent all those shifting aspects of design practices and organizations, as part of the international design practices domain. For better investigation of these aspects, the theoretical exploration will arrive at a concept of platform strategy to define feasible design outcomes of organizations that manifest sociotechnical dynamics of design practices in actual organizations. Concluding this chapter, a theoretical research framework, entitled '*the map of enacted organizational cultures in design practices*', will be established encapsulating all those theoretical discussions, which consist of four major dimensions**: (1) information systems; (2) attention structure to new product and service development (3) development of digital platform strategy, and (4) enacted organizational cultures**.

- **Chapter 3** establishes the best research methodology to be employed in design research. The discussion will be based on an understanding of design epistemology that is aligned with the domains of the research, and that holds different research epistemological traditions. In this study, in order to investigate the research aim, qualitative dominant-mixed methods were used (in-depth expert interviews with 29 design professionals; +150 secondary data sources that contain quantitative data sources about national and corporate organizational capabilities in design). This helps to develop and suggest new understandings of the relations between design, organizations, and organizational cultures in the digital design realm.
- **Chapter 4** will discuss the pilot study, and resulting insights, that was conducted by following the theoretical research framework developed and outlined from the literature review. The aim of this phase is to identify more detailed understanding for the subsequent main study. This phase is a part of research process to maximise analogical reasoning in alignment with the employed research methodology and the analytic approaches, i.e., case study methodology using abductive reasoning.
- **Chapter 5** presents research findings drawn from empirical data sources in the main study phase. These are analyzed with thematic analysis approaches. The findings are developed further based on the theoretical research framework; this is regrouped by considering newly drawn themes from the main study. The findings from this study will offer new implications about how approaches to holistic product design are hindered or enabled in different large organizational cultures; and about the approaches to design management, comparing new digital product development projects of Eastern- and Western-based organizations.

- **Chapter 6** will offer detailed discussion of the key findings. This not only provides understanding about differences of design practices in different organizational cultures between the East and the West, but also aims to provide a more nuanced comprehension of the meaning of designing, and implicit and explicit concerns of actual organizations, in the era of complex digitalization. Accordingly, the discussion will also raise issues about current design management studies that have missed agendas on sociotechnical contexts, such as relations between organizational cultures and evolving design practices in digitalization.
- **Chapter 7** will suggest a new theory. This will present a matrix of enacted organizational cultures in design management, in the era of digitalization. Using the matrix, a new design management model will be suggested: the Design Management Model for 'Designing' . The outcomes not only aim to represent the implications drawn from differences in Eastern- and Western-based organizational cultures in approaches to managing design, but also to reflect actual organizational aspects in design management in digitalization.
- **Chapter 8** will present a brief summary of this thesis and its contribution, limitations and future research agenda with key questions, by encapsulating tacit and explicit research outcomes.

From the following chapters, this thesis attempts to open new perspectives on relations between the dynamics of design practices, digitalization and organizational cultures, which have been rarely discussed in design studies. Through this journey, it will provide new opportunities for future scholars to expand areas of design management studies into the sociotechnical contexts of design, organization and digitalization under a realm of design epistemology.

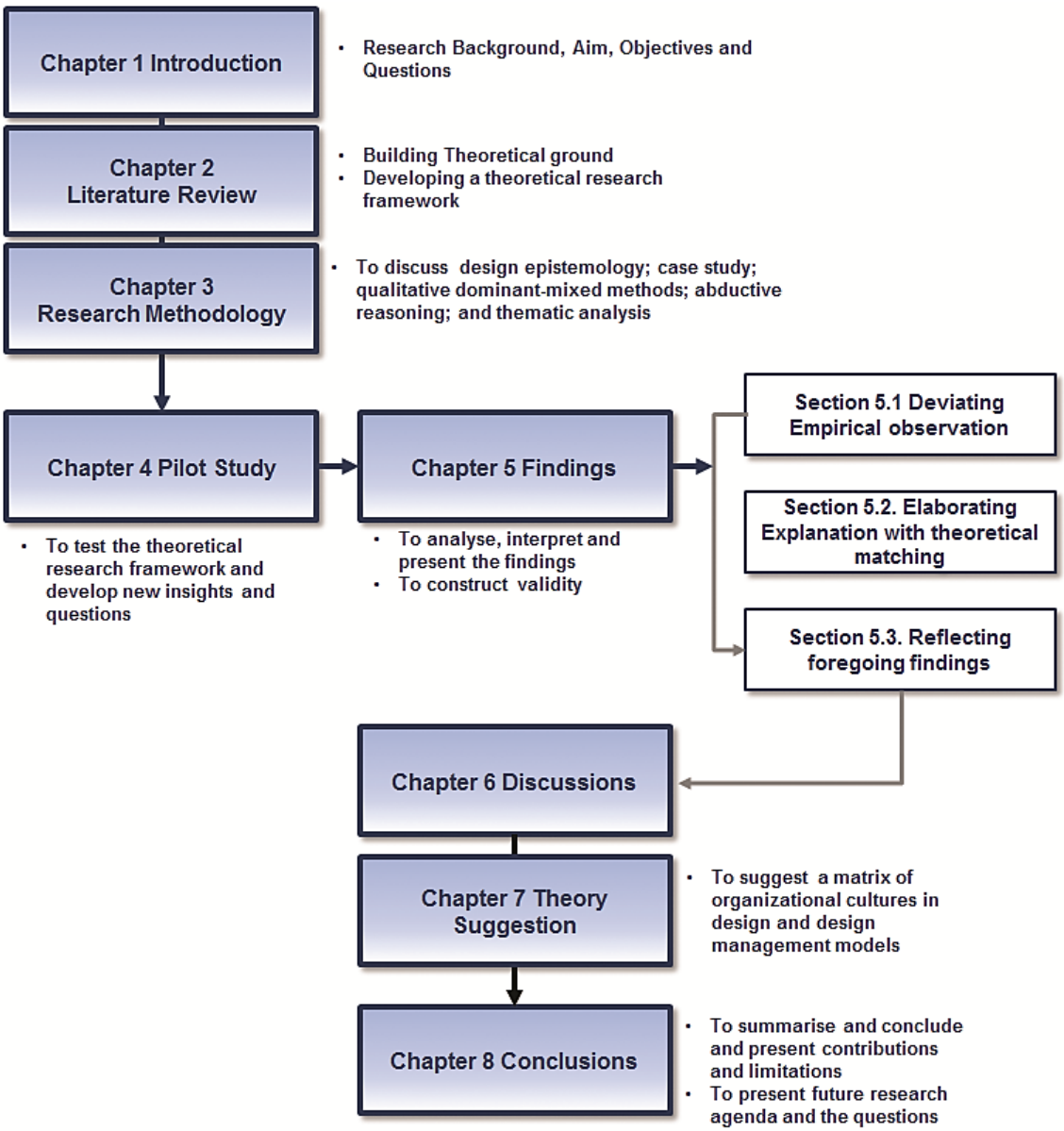


Figure 1.1 Structure of the thesis

2. Literature review

2.1. Introduction

New Approaches to Managing Design in Organizations

The rules and roles of design in digitalization have been significantly transformed; this not only influences the technical and functional properties of product and service design but also impacts on organizational, national and international contexts (Tilson et al., 2010; Yoo et al., 2010). Yet, there has been little interest in digital materiality, digitalization and the sociotechnical impacts in management and organization studies (Yoo et al., 2012). Neither have they been addressed in design studies, although the epistemological underpinning of design is distinguished from pure art and humanity studies: *pragmatism*. This chapter will address the theoretical ground for a better understanding of the relationship between design and organization. It will also discuss how it can be related to international and cross-cultural organizational issues in design management by exploring a broad range of scholarly literatures in design, organization science, management science, R&D management, innovation and international business studies and so on.

The concept of design is clearly distinguished from the fine arts, which were closely associated with the liberal arts and mathematics (Buchanan, 2001 a). Design is more accurately associated with social and technical issues beyond pure arts and humanities. However, this has been discussed in industrial product design for manufactured products with a focus on 'looks' only as related to machines and technology for mass production (dti, 2005; Buchanan, 2001 b; Heskett, 1980). The discussions include: design as creation of functional physical gestalts of serial artefacts by creating form, colours and dimensions, enhancing semantic aspects of physical product systems (Monö, 1997); creating a physical product that is to be well-functioning (i.e., design addressed as hard system) (Broadbent, 2003); or 'design as styling' for making a better product to be sold (Mozota, 2010). However, as technology has developed and human-made objects apply that technology, the relevant disciplines become more complex and require complex and multi-interdisciplinary senses, including engineering and manufacturing (Cross, 2008). 'Design' thereby plays a central role as a pathway, which brings a theory about practical actions via the creation of diverse kinds of products and experiences (Buchanan, 2001 b).

However, in the landscape of digital innovation, design studies are required for design professionals and organizations to learn newly addressed principles of organizational logic and approaches to managing design that can be adapted in actual design practices: i.e., new product development for digital technology-embedded product and services (Yoo et al., 2010).

In light of this, organizational cultures should be studied in relation to multiple human interactions and consciousness, which are greatly emphasized in those purposeful material practices (Smircich, 1983; Hofstede et al., 2010). In particular, cross-cultural study can help us to look closer at, and appreciate, different understandings of design and different approaches to managing design in organizations by investigating the representative domain of new approaches to managing design and digital technology-embedded product and service design. This chapter addresses the following key theoretical themes:

- Concepts of design and managing design in organizations (Section 2.2)
- Understanding of organizational cultures for international studies (Section 2.3)
- Complex organizations and managing design (Section 2.4)
- Digital new product and service design in organizations (Section 2.5)
- Setting a theoretical research framework (Section 2.6)

2.2. Concept of Design and Managing Design in Organizations

2.2.1. Design Epistemology: Pragmatic Approaches

It is important to have an understanding of the conceptual meaning of design in design and organization studies as it helps us to comprehend and clarify the design epistemology that underpins both design and organization studies. This is shared in both design and organization studies as both a focus on human interactions and their material practices. This begins by explaining the pragmatism that underlines all kinds of human material practices, from the intangible to the tangible.

Pragmatism emphasizing 'experience' that balances abstraction and rationality

The term pragmatism originates from the writings of early 20th century American philosopher, John Dewey (Easterby-Smith et al., 2012). The idea has spread amongst professionals who emphasize reflection-in-action, as opposed to traditional, *technology-rationality* centred, positivist approaches (Schön, 2011). It is focused on the balance between actual and abstract, and the reflection and observation of them. This, therefore, highlights *experience* as a vital sense that solves problems through the sense of *structure* and *pattern*. In pragmatism, the *problematic situation per se* is believed to imply *anticipatory solutions* so that a concept *perception*, i.e., a going-out activity holding energy to receive problematic situations (experiencing or before experiencing), is distinguished from '*recognition*', i.e., with little consciousness of it (experienced) (Dewey, 2005). This is clear from the following quotation:

> The difference between the two is immense. Recognition is perception arrested before it has a chance to develop freely. In recognition there is a beginning of an act of perception. But this beginning is not allowed to serve the development of a full perception of the thing recognized. It is arrested at the point whether it will serve some other purpose, as we recognize a man on the street in order to greet or to avoid him, not so as to see him for the sake of seeing what is there. In recognition we fall back, as upon a stereotype, upon some previously formed scheme (Dewey, 2005: p. 54).

In this context, pragmatism compromises realism with relativism in the intermediated position. This neither accepts predetermined theories, such as certain frameworks that shape knowledge and truth, nor pure constructionist approaches, whereby people can construct their own truths out of nothing and that are concerned with lived experiences of people (Easterby-Smith et al., 2012).

Herbert Simon (1996) has further developed and applied the approaches to human material practices and design. He looks into the 'artificial' that humans make, and distinguishes between the natural sciences, which develop valid knowledge of natural objects, and the science of the artificialmade by man (see also van Aken, 2007).

Design epistemology underlined in on-going problem-solving

The concept of design is, therefore, rather underlined in the act and service of actions upon one's situation to improve one's condition through developing knowledge to improve problems by designing the intervention of the problem and devising the systems or artefacts (i.e., framing the knowledge properties based on materials (material and immaterial)) to be used (experienced) (van Aken, 2004; Denyer et al., 2008); A design process can be referred to as the on-going status of understanding all of those cause and effect relationships that head toward complete artefacts that are situated in incompleteness at the moment (Garud et al., 2008). This is stated in the following quotation:

> Designs may refer to entities such as actions, structures, processes, or systems. Design methods may refer to design processes, design roles, and more specific methods for solving certain types of design issues. The two defining characteristics of design science are its interest in field problems and its solution focus, namely, the focus on interventions or systems that can solve field problems. Designing is a natural, intuitive, and creative process. Everyone on an on-going daily basis (consciously or unconsciously) is engaged in designing his or her actions and in designing solutions to the minor or major problems of everyday life (van Aken, 2007: p. 69).

It indicates that all surrounding human-made artefacts can be said to be on-going artefacts that are designed and designing to reach completeness, including a *product or organization* in a realm of dynamic human inquiries, concerned with how we live and what we live for. Based on this, the next

section will explore how design and organization studies regarding human material practices (product design) can be posited in common grounding.

Based on the pragmatic approaches, there has been scholarly discussion of design as a research mode or the pathway, e.g., design science (van Aken, 2004; van Aken, 2007; Romme, 2003).

> Design is based on pragmatism as the underlying epistemological notion. That is, design research develops knowledge in the service of action; the nature of design thinking is thus normative and synthetic in nature—directed toward desired situations and systems and toward synthesis in the form of actual actions. The pragmatism of design research can be expressed in more detail by exploring the normative ideas and values characterizing good practice in professions such as architecture, organization development, and community development (Romme, 2003: p. 562).

This epistemological focus underpins that design can be regarded as a pathway covering unique problematic situations with purposeful and ideal solutions by applying systems thinking, which aims to present special kinds of solutions for *field problems* and *problematic situations* to improve conditions and development (Romme, 2003; van Aken, 2004). It has been incorporated in professional disciplines concerned with devising specifications of system boundaries, such engineering, medicine, law etc., and in the fields of management science, organization science and design management, by distinguishing from pure explanatory sciences such as natural sciences; sociology and economics.

2.2.2. Common Grounding of Product Design and of Organization

This section explores how design studies about products and organizations can be discussed in the same school of pragmatism. Debates on design practices within the pragmatist paradigm offer opportunities for design studies to extend to all kinds of human material practices and relevant areas. This includes product and service design as well as organization development and community development (Romme, 2003). These all indicate that design practices are on-going quests to improve all human conditions and problem-solving processes through the development of relevant knowledge (Fay, 1996; van Aken, 2007).

Products as organizational outcomes

First of all, a nuanced concept of ‘product’ has been variously discussed in innovation, design, management science, and psychology studies, all of which are situated in organizational contexts. From the psychological perspective, it is addressed in organizational creativity for innovation. The concept of ‘product’ is simply defined as one of a number of observable outcomes or responses (Amabile, 1983). So, an organization’s new product is defined as a distinguishable outcome that can

lead to innovation, and it stems from organization creativity (Woodman et al., 1993; Amabile, 1983; Amabile et al., 1996).

In innovation studies, a new product is often regarded as the significant indicator that can represent an organization's and nation's capabilities in marketing and technology, as related to subsequent impacts of new products in their implementation. Thus, product innovation is often critically discussed in organisations because this can help change an organisation in terms of its status in market, technology, and competition with its new product (Dougherty & Hardy, 1996).

Garcia and Calantone (2002) attempted to define types of innovation by employing a concept of new 'product' and 'organizational capabilities', or a typology of the terminology of innovation (Figure 2.1). This was addressed by implementing the level of newness of the product, in terms of technological and commercial success, and whether it was achieved within reach of the micro-level (product, market, firms, technology and customers), or opens up macro-level changes (new markets, new different sets of engineering technology and new scientific principles, involving the world). The type of innovation is determined by the degree of innovativeness or newness of the *products***,** within which the result impacts on their discontinuity in meeting the needs either in 'markets' or in 'technology' or both (Garcia & Calantone, 2002; Danneels & Kleinschmidtb., 2001) (This will be further discussed in Section 2.4.3.3). The principles have been implemented and adapted into the following empirical studies using modularity theory to account for new *product* innovativeness (e.g., Lau et al., 2011) and also to generate a new matrix of innovation landscape to account for a relationship between innovativeness and technical and business models (Pisano, 2015).

These theories explain the significance of organizational capabilities in creating and developing new products, i.e., organizational capabilities to create or refine a complex system where product components are modules interacting with other modules, or where the internal structure functions interdependently (Pil & Cohen, 2006; Langlois, 2002; Schilling, 2000: this will be discussed further in Section 2.3.1 on design rules).

Human-made artefacts and organizations

To explain the relationship between organization and product, the consensus of epistemological focus of the two domains is taken into further account; its relationship to design epistemology is discussed in Section 2.1.1. In fact, a concept of design is also applied to organization studies and human material practices by focusing on how to change and/ or create artificial objects in various ways (Romme, 2003; van Aken, 2004, 2007). In organization studies, organizations are viewed as representing all types of human artefacts, including their own environments, social structure, culture, technology, power, conflict, control and so on (Hatch, 2006). This is specified in a concept of *Gestal**t*** that has been addressed in explanations of *physical product design* and is also applied to *organization studies and organization designing*. *Gestalt* has been defined as a pattern of elements; as such, a whole unity of parts is not simply a summation of its parts, but a unique set of characteristics of the

unity. Thus, even if individual parts are not complete as a whole unity they can be perceived as whole by sensing the incomplete parts as the whole figure of the unity of the parts. Likewise, *Gestalt* in organization designing suggests that an organization's ability to approach its design problems is also reflected in the organization's design outcomes. The organization and its design outcomes are viewed as a unity of the parts as a whole (Yoo et al., 2006).

As to the explanation of the relationship between human-made artefacts and organizations; all those are addressed based on *artefaction perspectives*; in other words, all human-made things are artificial objects that are socially constructed, and so those artificial objects are viewed as vehicles of functional and social meaning (Romme, 2011; Denyer et al., 2008; Cross, 2008; Yoo et al., 2006). Romme (2011) specified the concept as follows:

> An artefact can also be viewed more broadly, as any tangible or intangible (e.g., cognitive, social, or cultural) "fact" created by human beings. This implies that products, services, organizational structures, organizational identities, business strategies, multiuser networks, management tools, projects, and discourses can all be conceived as artefacts. Each of these examples can be "objects" of attempts to design and create. Artefacts can thus be defined as socially constructed vehicles of functional and social meaning […] I thus employ the notion of artefaction merely as a so-called "sensitizing concept." A sensitizing concept serves to demarcate the domain of observation in terms of specific behaviours and processes (cf. interventions as socially constructed processes loaded with functional and social meanings) (Romme, 2011: p. 12).

Product as 'milieu'

With the understanding of organization as human-made artefact, much scholarly literature contends that a product that is designed by an organization can be a manifestation of the organization as a whole (Junginger, 2008). This concept is rooted in the interpretation of a notion of *environment* surrounding all human material practices in pragmatists' epistemological underpinning. For John Dewey (1948):

> What is called environment is that in which the conditions called physical are enmeshed in cultural conditions and thereby are more than "physical" in its technical sense. "Environment" is not something around and about human activities in an external sense; it is their medium, or milieu in the sense in which a medium is intermediate in the execution of carrying out all human activities, as well as being the channel through which they move, and the vehicle by which they go on (Dewey, 1948: p.148).

In the line with this, Simon (1996) viewed all human-made artefacts as interfaces in which humans' problematic situations and the anticipatory solutions are placed together forming a meeting point

between an ‘inner’ environment, where the substance and organization of the artefact itself, and an ‘outer’ environment’, such as the surroundings in which it operates.

In a similar sense, Gilbert Simondon (1958) also suggested a notion of milieu that can be found in technical objects. He focused on principles of building a technical object. The technical objects have adapted and evolved between the material and human conditions to their given environment with some specialization.

Based on these definitions, the notion of *milieu* has been variously applied in explanations of human material practices. Margolin (1995) summarized the relations between the term ‘product' and ‘design’. Product is defined as a ‘milieu’ because all man-made complexity-embedded material and immaterial objects fill certain complex systems, and so the conception and planning for these products can be denoted as ‘design’. Margolin states:

> By “products” I mean the human-made material and immaterial objects, activities, and services, and complex systems or environments that constitute the domain of the artificial. And I intend “design” to denote the conception and planning of these products. […] I refer not only to the outcomes of professional design practices but also to the vast results of design activity that everyone engages in (Margolin, 1995: p. 122).

Similarly, from an organizational perspective, Schein (2010) stressed that artefacts, including the technology that organizations create, are a reflection of underlying organizational assumptions.

To conclude, products and organization are all situated in human material practice-based environments in solving humans’ problematic situations in complex conditions. Within that context, design is defined as specialized ways of planning and synthesizing all those solutions with devised objects (the material and the immaterial), concerned with given complex problematic situations and their solutions. The next section will explore how approaches to human-made artefacts differ according to different inquiries in systemized approaches.

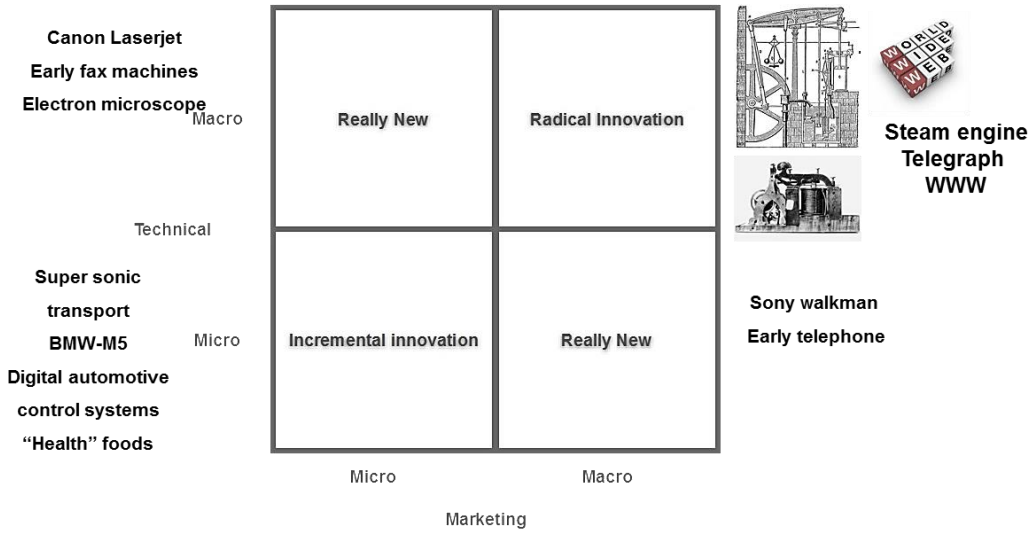


Figure 2.1 Innovation typology and the representative new products

(Adapted from Garcia & Calantone, 2002: pp. 120-124)

2.2.3. Towards Evolutionary Perspectives in Design and Organization Studies

To study human-made artefacts, it is important to understand a notion of 'system' and 'system thinking', and how approaches to them have been developed in the relevant studies: design, organization and system thinking studies. This brings attention to holistic approaches to design and the evolutionary perspectives regarding design practices in organizational environments.

2.2.3.1. Emerging evolutionary perspectives on complex systems

Concepts of evolution, systems, organization and design practices have been discussed in organization and design studies in order to account for the complexity by applying biological perspectives to the studies (Reeves, et al., 2016). The word, 'systematics' is used in discussion of classification of organizations and the differences: e.g. how organizations function themselves and are adapted to environment; and how to classify them, taking account into biologists' approaches. Like biologists attempt to classify diversity of species, organizational scientists and economists have used the terms for the study of diversity of organizations with own classification theories (McKelvey, 1982; Scott, 1998).

However, adoption of the nuanced meaning in 'system' can be also more useful to clarify a relationship between design practices, organizational inquiries and organizations from the evolutionary perspectives. For this, it is useful to understand 'systems thinking'. Initially, Checkland and Scholes (2004) introduced a notion of systems thinking by clarifying the adjective forms 'systematic' and 'systemic' that comes from the noun 'system'. For them, the adjective 'systemic' embraces a definition of 'system' that concerns a system as a whole, and so it implies systems thinking. So, systems thinking suggests consciously organized thought, which makes use of that

concept, ‘system’, in referring to a complex whole, whereby the whole has properties consisting of the whole and the parts that make up the whole. The root of systems thinking is, in fact, in Herbert Simon’s theory of pragmatism, which has been addressed earlier (Checkland and Scholes ,2004, p.A6: see also Section. 2.1.1). In a broad sense, Simon defined the hierarchy of complex system and complexities as follows:

> By a hierarchic system, or hierarchy, I mean a system that is composed of interrelated subsystems, each of the latter being in turn hierarchic in structure until we reach some lowest level of elementary subsystem. In most systems in nature it is somewhat arbitrary as to where we leave off the partitioning and what subsystems we take as elementary (Simon, 1996: p. 185).

Based on the concept of hierarchical system, and as notable design scholars have observed (Buchanan, 2001a, 2001b), the theory addressed by Checkland (2004) also pinpointed that this world is characterized as complex, problematical, and fuzzy. Therefore, there are increasing needs to cope with those ill-defined situations using organized learning ways, as other pragmatists and design theories have addressed. In explanation of organized learning ways, Checkland (2004) distinguished hard systems thinking from soft systems thinking. Hard systems thinking is focused on determined, well-defined technical problem solving, whereas soft thinking is appropriate in fuzzy, ill-defined situations such as human-relevant issues including cultural issues, legal systems, education systems and transportation systems.

Soft systems thinking is rather referred to as being an emerging ‘*organized learning system*: this points out that the world is defined as *the process of inquiry*. This is distinguished from hard systems thinking that views this world as ‘systemic’ *per se*. Soft systems thinking therefore approaches problematic situations by drawing more *‘holistic pictures’*, rather than *reductive and linear approaches* about the given problematic situations. Soft systems thinking is, therefore, carried out through multiple levels of analyses that provides a framework to analyze ‘contexts’ offering the ‘outcomes’ of the process for practical solutions, i.e., that solutions from soft systems thinking are, as yet, determinant answers to a question (Checkland & Scholes, 2007).

In this sense, it is important to understand the different principles of ‘inquiries’ towards ‘systems’, whereby a type of systems thinking is somehow determined by an approach to a given inquiry. That includes reductive, holistic and rational principles. Specifically, the birth of the term ‘holism’ was rooted in a common background with *Gestalt* and *creative evolution* after World War I, due to the interest in complex systems and complexities (Simon, 1996). Smuts (1929) discusses it as follows:

> Holism regards natural objects as wholes…It looks upon nature as consisting of discrete bodies and things…[which] are not entirely resolvable into parts; and …which are more than the sums of their parts, and the mechanical putting together of

> their parts will not produce them or account for their characters and behaviours (Smuts, 1929 cited in Simon, 1996: p.170).

Following this, Mckelvey(1982) listed the abstractions between reductionist, holist and rationalist to clarify these two meanings with an understanding of Schwab's (1960) approaches as the following:

- Reductive principle: This takes a look at the constituent elements of an object to explain its behaviour.
- Holistic principle: This views a system as interdependencies, rather than looking into a single part of a system. So, the focus is on the pattern of relations amongst parts and between the parts and the whole.
- Rational principle: This principle looks outward to the larger system or environment in which it is embedded, emphasizing an object or artefacts tied with its environment.

These principles are broadly applied and adapted to explaining complex systems as well as all kinds of complexities, e.g., biology, physics, economics etc. (Simon, 1996). However, the interpretation of the separation of holism and reductionism, and the usefulness in implementation of adaptive complex systems and complexities, should be done carefully. This is still an emerging issue, as neither term can be ignored in accounting for complexities: for instance, details of components can be ignored (i.e. reductive approaches) whilst looking at the interactions in the whole systems (i.e. holistic approaches); whereas if taking a look at the details – reductive approaches – the shorter term oriented approaches to individual subsystems can be better described in details ignoring the rather slower interactions amongst those subsystems – holistic approaches (Simon, 1996: pp. 170-172).

2.2.3.2. Evolutionary perspectives in organization studies

To further consider evolutionary perspectives involving holism, this thesis takes a look at discussions illustrating viewpoints of organization theories that head towards evolutionary perspectives. Organization studies have been developed by shifting attention from *reductionism* to *holistic and rational principles* in order to explain a relationship between organizations and surrounding environments (McKelvey, 1982; Scott, 1998: p.92). This was specifically addressed in a theoretical model suggested by Richard Scott (1998). Scott proposed a layered model divided into four levels: closed rational system, closed natural system, open rational system, and open natural system. Scott's model was based on an in-depth conception of hierarchy of organizations as the main features of all kinds of complex artefacts. The model was accordingly established in relation to both technical and institutional environments, neither ignoring technological controls in generating artefacts, products and services (e.g., concerns about cost or quality), nor overemphasizing institutional elements such as cultural, social or human systems alone. The trajectory of the model can thereby be summarized as shifting organizational studies from reductionism (**closed rational system and closed natural system**) to rationalism, encompassing evolutionary perspectives (**open rational system and open natural system**) (Scott, 1998; McKelvey, 1982). The brief details are included as follows:

- First, taking into account the 'closed realm' in the closed rational model, the emphasis of discussions about complex organization had been focused on efficient production and uses of effective technology, based on underlying assumptions that organizations are defined as 'rational systems' driven by standardized practices, like disciplines with bolts and nuts. Most early studies, such as those in scientific management led by Taylor (1911), Max Weber and Simon, had been addressed within this context from the early 20th century up to about 1960 (Scott & F.Davis, 2007; Scott, 1998). Thus, attention was paid to maximizing profit and efficiency under 'rationality-based' single hierarchical organization structures, with a lack of understanding of members' behaviour or attitudes. On the other hand, closed natural system models were also discussed inside organizations, but also begun were the discussion of 'human' issues such as human relations (Whyte, 1959) and cooperative systems (Barnard, 1938), and so on.

- Second, the open realm includes **open rational system** models and **open natural system**. This started with discussion about inside and outside organizational environmental issues concerned with the socio-psychological aspects of organizations. This generation of theories, therefore, started compromising much complex human enactment and institutional issues such as organizational cultures (Scott, 1998). This open system realm is broadly based on the theory of bounded rationality introduced by March and Simon (1958) whereby employees are 'bounded' with an organization in the organizational setting through a certain exchange agreement (Rousseau, 1995; Scott, 1998). This theory triggered later researchers to pay attention to the importance of studying socio-psychological regards for adequate analysis of organization. The central concerns of the theorists were that there are cognitive limits to individual decision-makers and decision-making structures, and there are many recognizable variables that exist in tasks and environment. The viewpoint is therefore shifted to more open environment within an organization.

- **Encompassing evolutionary perspectives and adaption of organizations in sociotechnical contexts**: In the meantime, the continual discussions about 'rational' and 'natural' systems in the open system realm contributed to developing ecological and evolutionary perspectives moving beyond hierarchical systems of human-made materials, i.e., complex systems of organizations and artefacts (Pondy & Mitroff., 1979; Smircich, 1983). Early theorists on open systems discussed a range of rationality-based organizations (i.e., open rational system models). However, in discussions about open natural system models, the theories began by encompassing social and technological issues: **sociotechnical systems** (Jaques, 1951; Miller & Rice, 1967; Trist, 1981 cited in Scott, 1998). Their research was focused on how work practices differ in organizations in terms of relations between both social and technical

systems, rather than on rationality-based technical issues of organizations (i.e., a nonhuman system and a human system). In this research realm, even the research approaches started by preferring 'action research' for detailed investigation about management and labour (e.g. Jaques, 1951). In particular, these theories began by discussing **the adaption of organization and adaptive systems**: an individual organization is adapted to its environment over time by changing its characteristics, while an organization selects its environment (population ecology theories), or it is changed due to dependence on its given resources that are always scarce to sustain such an organization (resource dependence theories) (Scott, 1998: pp.115-116; Simon, 1996: p. 25).

- **Discussions about organizational cultures and human enactment:** Through above those discussions, concepts of **organizational cultures** have become significantly discussed within the open system model, including the institutional theory during the 1970s and up until the current time (e.g. Diggio & Powell, 1983; Meyer & Rowan, 1977; Selznick, 1949 cited in Scott 1998) in line with relevant social sciences, including economics, political science, and sociology. Neo-institutional theorists have started emphasizing the importance of cognitive and cultural controls, which are a set of beliefs developed in social interaction. This provides models and guidelines for governing and guiding behaviour in varied social situations (Scott, 1998). In reaching the **open natural system**, the emphasis of organizations is not only on rationality or efficiency. The theorists have come to believe that both socially constructed belief systems and normative rules exercise control over organizations. In the line with this, theories appeared in the early 1980s on organizational culture that focus on human enactment at the organizational level, and these have been rapidly developed (Smircich & Stubbart, 1985; Smircich, 1983; Smircich, 1985: This will be disucssed further in Section 2.3.3).

Accordingly, reference to those evolutionary economic perspectives became explicit: for instance, Shumpeter (1942) introduced the concept of innovation and emphasized creative destruction (cited in Henderson & Clark, 1990; also Scott, 1992). Following this, Nelson and Winter's (1982) evolutionary theory and Langlois' (1986) neo-institutional theory in economics were introduced. In particular, Langlois (2002) was also interested in modularity theory from sociotechnical perspectives, whereby all systems consist of subsystems and the approaches have come to encompass both inside and outside the system and the contexts at the same time (modularity theory will be discussed further in Section 2.5.2 on design rules).

2.2.3.3. Evolutionary perspectives in design studies

On the contrary, approaches to 'systems' that embrace socio-technological perspectives are currently being discussed in design studies, thus moving into evolutionary perspectives. Evolutionary artefacts have already been hypothesized in Simon's (1996) theory as he addressed the principle of 'nearly

decomposability' in human-made artificial systems including products and organizations (Sanchez & Mahoney, 1996;p.64). This explained how 'intracomponent' linkage, involving an internal structure of the component, is greater than 'intercomponent' linkage, involving only interaction among components. Decomposability is here defined as the partitioning of a system in ways where the interactions between the components and the internal structure are greater than the interactions between only components (see also Garud et al., 2008). With reference to this, Simon (1996) contended that if stable intermediate forms are devised to act in such interactive ways in a partitioning of a system, complex systems (human-made artefact) could be evolved rapidly.

In order to explain this, Simon (1996) (see also Baldwin & Clark, 2000; Garud, 2008) related a parable about two watchmakers, Hora (who prospered) and Tempus (who lost his business):

> The watches the men made consisted of about 1,000 parts each. Tempus had so constructed his that if he had one partly assembled and had to put it down – to answer the phone, say – it immediately fell to pieces and had to be reassembled from the elements. The better the customers liked his watches, the more they phoned him and the more difficult it became for him to find enough uninterrupted time to finish a watch. The watches that Hora made were no less complex than those of Tempus. But he had designed them so that he could put together subassemblies of about ten elements each. Ten of these subassemblies again, could be put together into a larger subassembly; and a system of ten of the later subassemblies constituted the whole watch. Hence, when Hora had to put down a partly assembled watch to answer the phone, he lost only a small part of his work, and he assembled his watches in only a fraction of the man-hours it took Tempus (Simon, 1996: p. 188).

However, the extent of the principle of decomposability, and those evolutionary artefacts, are now expanded into embracing all kinds of sociotechnical aspects in the realm of design. From holistic perspectives, the principles of higher dynamics, between an internal structure of a subsystem and a set of components, have become applied to all relations between human-made artefacts, components and the surroundings (an internal structure or much larger structures as a subsystem of a whole).

Broadbent (2003) attempted to account for the evolutionary perspective in design practices by addressing and classifying design methodologies to the relevant practices. He viewed design methodologies in design practices as differently implemented into specific complex-systemized artefacts, with each one requiring specific design inquiries and approaches to systems for synthesizing and coordinating relevant artefacts. This categorization helps us understand new design disciplines that are currently addressed, and explains how intangible design becomes involved in design studies from holistic perspectives, e.g., service design (Meroni & Sangiorgi, 2011), process design, and 'branding and marketing' in the design realm (Cooper et al., 2005; Mozota, 2010). This embraces all tangible design outputs and intangible assets of design practices from total design perspectives (Hollins & Hollins, 1991). The detailed categorization is shown in Table 2.1. Regarding evolutionary

artefacts in design studies, this will be further discussed in the explanation of the concept of platform as the stable intermediate in Section 2.4.5.

In summary, the debates in design and organization studies have already started to include evolutionary perspectives and the holistic aspects that are situated in all kinds of human-made artefacts. In particular, there are increasing demands to consider the sociotechnical aspects surrounding human material practices, including communities, society, organizations and national issues (Cooper et al., 2009; Cooper & Junginger, 2013). From this perspective, cultural issues cannot be ignored. The next section will discuss further how organizational cultures cannot be disassociated from such evolutionary movements in design and organizational studies.

Progression of Approaches to Design				
Main Features	**Craft & Design-by Drawing**	**Hard systems**	**Soft systems**	**Next generation**
Types of principles to approach inquiry	**Reflective consciousness/ reductionist**	**Structured systems thinking**	**Holistic systems thinking**	**Evolutionary systems thinking**
Grounding Science	Trial and error pre-scientific	Mathematical, Natural Sciences for structured product systems in reductionist science : Focused on objective, theory-based, positivist, functionalist for simple, technical, specific, and tamed problem solving	Mathematical, Natural & Social Sciences for solving diverse problems of user's experience in holistic science : Embracing subjective, wisdom/value based, experiential, empirical, pragmatic, phenomenological, hermeneutic, action based for complex and wicked problems	Holistic and rationalist science for contributing to sociocultural problem solving
Technological support	Simple hand tools/ manual/ mechanical	Mechanical/electronics	Mostly electronics	Extensive electronic support
Scale	Individual designer's perceptual span	Project & strategic approaches by organization	Strategic approaches by organizations (national and global)	Global and societal beyond regional barriers
Product Structure Features	**One single entity**	**Single hierarchical modular product**	**Multiple hierarchical and layered modular product**	**Layered product**
Types of Design	**Simple hand tools used pre-disciplinary artworks**	**Industrial design: Creating physical aesthetic**	**Service design: Creating new explicit new experiences**	**Design as designing in organizations**

Table 2.1 Types of Design Methodologies by systems: towards evolutionary (adapted from Broadbent, 2003)

2.2.4. Overview

This section has discussed how design and organization domains are extensively studied in common epistemological grounding. Unlike traditional scientific (positivist) or constructionist approaches, the emphasis of pragmatism is focused on 'experience' so that it balances rationality and abstraction in solving actual field problems. It directly underpins design actions along with organizational work

practices by making an artefact of an organization. Through this discussion it deduced the current grounding of design and organization studies, whereby product as design outcome can manifest an organization (or organizations). Therefore, 'product' can be defined as the sociotechnical objects that represent an organization (or organizations), so that it can be said to be a 'milieu'.

This draws a detailed conception of design in product and organization by looking at the term 'system' and the system thinking that devises 'design practices' for product and organization design. Looking at different enquiries into and principles of complex systems constituting all human-made artefacts (i.e., reductionist, holistic and rationalist), design and organization studies now consider an evolutionary perspective that involves all kinds of sociotechnical issues in human-made artefacts.

2.3. Understanding of Organizational Cultures from Cross-cultural Perspectives

2.3.1. Organizational Cultures as a Reflection of Systemic Artefacts

This section explores the significance of studying organizational cultures and the different approaches to material practices. The term 'culture' has, in general, been defined as the domain of human life that affects members of a society and consists of the shared experiences among society members using shared symbols (Alvesson & Sveningsson, 2008). As such, it often represents a community, a population, and an entire human life through the sum of social behaviours, invisible collective values and artefacts (Kotter & Heskett, 1992). Culture is, therefore, defined as collective norms and rules that give directions and ways that are acceptable, as related to one human group's structure that shapes one's mental phenomena. So a certain common culture is inferred by a shared set of values, standards and a common political vocabulary that comprises homogeneity (Fay, 1996).

In this sense, a concept of organizational culture implies ways in which an organization is conceptualized as one entity, being a collection of individuals who share their own values (both structural and political), where human interactions and conciousness reside. Organizational cultures have been variously studied following an open-natural model, encompassed by organization-environment in holistic approaches, as opposed to conventional rationality-based material organizations (Pondy & Mitroff., 1979; Scott, 1998; Smircich, 1983)(see Section. 2.1.3). Regardingthat, Pondy and Mitroff (1979) attempted to bring critical attention to the foregoing organizational studies by questioning the open system models of organization that were being newly addressed at that time. This emphasized that organizational studies need to be aware of metaphoric senses to view organizations as institutional, ecological entities and collections of human conciousness, moving beyond debates about open or rational (closed) systems. By doing so, it

embraced a dynamics of organization-environment; the creative growth, its languages and development of *organizational cultures*. That is reflected in later discussions amongst scholars about organizational cultures.

Smircich (1985) stressed that a society/group/organizational culture underlies human consciousness and implicit assumptions, which explains why a population (human members of a society) do things as a structure for life; this includes taken-for-granted *structural* proceedings, shared beliefs, meanings and values like languages. Similarly, Schein (2010) viewed culture as a foundation of social order and of rules that imply dynamic phenomena and a coercive background structure. Alvesson and Sveningsson (2008) define culture as one human group's *structure* that plays a central role as a guidance encompassing mental phenomena. This all implies that a culture is a fairly stable set of taken-for granted assumptions, shared beliefs, meanings, and values that form daily *structural* systems, such as language, in human life (Schein, 2010; Smircich, 1985; Bate, et al., 2000).

In terms of this, an organizational culture reflects collective members' shared beliefs, rules, and values with their visible artefacts that represent their intentions, enacted projects, and activities. One group's underlying assumptions and espoused beliefs regarding '*what ought to be'* in goals reflect in a visible layer of culture (i.e. artefacts) such as process, observed behaviour, technology, and even products (Schein, 2010; Andriopoulos & Dawson, 2009).

Consequently, it is important to note that concepts of organizational artefacts and organizations have been discussed within a boundary of notions of certain 'systems'. Analysis of organizational cultures is also addressed in respect to structural artefacts: there are several notions of different groups that have their own social systems, such as nation, region, ethnic group, gender, generation and occupation within the notion of 'culture' (Hofstede, 1994). Focusing on this, Schein (2010) labelled the levels of organizational culture by dividing them into two areas: macro- and micro-cultures.

- *Macro-cultures:* 'national and ethnic cultures' are *organizational cultures* that refer to private, public, government organizations and the other sub cultures;
- *Micro-cultures*: cultures are somehow situated at the level of an organizational culture – group/units and individuals.

This suggests that the criteria discerning one cultural group from another consider that there are different collective systems along with a certain level of hierarchical systems containing sub-systems. In other words, the levels of organizational cultures are formalized in certain hierarchical and systemized orders: macro-cultures situated as fundamental grounding that supports micro-cultures.

A unit of national culture is, therefore, posited at the fundamental level of cultures. It embraces other subsequent organizations/groups/communities, historically and socially, as it is integrated into the

whole subset of individual societies; as a political unit; and develops the whole of society with one dominant national language, common mass media and national system (Hofstede et al., 2010). The collective attitudes of a group of members in sub-organizations and sub-groups tend to explicitly reflect their 'national culture' in their work practices (Schein, 2013; Schein, 2010; Schein, 2010; Brett et al., 2006).

In consequence, the next section will explore factors to be considered in organizational cultures studies that are situated in debates on differences, amongst others, in order to be posited in an intermediate position, i.e., relativism.

2.3.2. Relativism and Organizational Culture Studies

To understand the concept of organizational culture, it is important to distinguish between the different and the relative from within the philosophical viewpoint known as *relativism*. After Kuhn (1962) suggested *incommensurability*, certain kinds of comparison between theories were impossible; for example, ignoring the distinction between discovery and justification; so that theories within different paradigms are incommensurable (Lewens, 2015; Stanford University, 2011). Kuhn's the idea has therefore deeply affect to form relativism especially in social science.

It has been controversial among radical *perspectivists* that our conceptual framework underlying human experience is likely to be same for every person under a single universal set; the view of the positivist perspective (Fay, 1996). The *perspectivist* approach states that a reality should be identified through empirical observations and tested to attain fully warranted and objective knowledge within a provided framework. However, the understanding of relativism differs from positivist approaches; it starts with the understanding that properties of individuals who express themselves through culture are the function of their society or the broad system of meaning from holistic perspectives (Fay, 1996; Hofstede et al., 2010: see also the meaning of holism in Section 2.2.3.1).

Focusing on this, the notion of '*different"* is underlined. Fay (1996) noted that differences between individuals or groups conceive different 'systems' as social structures that determine the way for the members to behave and relate (also Lewens, 2015). Hofstede (2010) also viewed the meaning of such differences in a similar way: if a person migrated to another nation they should adapt to the new nation's explicit identities, including language, religion etc.; being the visible systems reflecting insight into the nation (Hofstede et al., 2010).

However, differences between those systems have been situated at ill-defined and blurred boundaries, which are hardly separated between text and context, due to our continuingly changing worlds (Garud et al., 2008; Krippendorff, 2011). Burke (1957) (cited in Fay, 1996) underlined that culture is not a text to be read only, but a conversation in metaphor: open and fluid. At the same time, it is structured as a verb that could be extended, altered, and sometimes transformed by interacting with the members'

appropriate activities (Fay, 1996). From this point of view, any cases of agencies/artefacts in different cultural groups can be 'relative'. To observe only difference leads to '*perspectivism*' (i.e., positivism).

In this sense, our conceptual scheme, which is characterized as a complexity of interrelated and hierarchically arranged basic assumptions for providing 'theories', can be different in accordance with different cultures, times and communities. And so, it can be said that all our knowledge itself is established though a constructive activity, i.e., *relativism* (Fay, 1996). It stresses that humans may live inside radically different worlds, in which different conceptual schemes are formed that shape one's experience and knowledge through their systems, and so the realities can be ontologically different. Yet, much attention has been paid to the notion of *'difference'* and, implicitly, how we see one's differences from others, and why these differences are accomplished without any understanding of the backgrounds and contexts (Fay, 1996).

It is, therefore, important to understand the study of difference in organizational culture studies in order to understand a background of common beliefs, desires, and principles of thoughts (Davison, cited in Fay, 1996). Following on from this, the next section will discuss the different concepts of organizational cultures and the different approaches to a concept of organizational culture that affects analysis of organizational culture studies.

2.3.3. Concepts of Organizational Cultures for Analysis

Organizational cultures have been diversely studied, following an open-natural model that encompasses organization-environment in holistic approaches. This was a shift from conventional rationality-based material organizations (McKelvey, 1982; Scott, 1998). As stated in previous sections, organizational cultures have been discussed in terms of how one organizational culture is interplayed as a certain interdependent variable between members and an organization, or between organizations as sub-units and a national culture and so on (Smircich, 1983; Bate, et al., 2000: e.g.Hofstede et al., 2010).

However, in the realm of the extended open-natural model and evolutionary model (Scott, 1998), it is important to note that there are different concepts of organizational cultures for analysis.

Rousseau (1995) viewed organizational cultures differently as collection of individual members' beliefs to an organization. Contracts in organizations are a wide range of interpersonal arrangement and societal norms with a focus on members' behavioural aspects along with organizations' normative aspects, rather than such instrumental perspectives. Cultural beliefs on an organization are situated in normative contracts that the individual members already identify their identities and the group psychologically; so that an organizational culture is symbolic rather than instrumental sharing members' unconscious beliefs and the values reflected in members' behaviour and artefact. An organizational culture is said to be a type of contract that binds employees within an organization, in

an organizational setting, through a certain exchange agreement psychologically and normatively. The similar idea was however more specified by the notable scholar in organizational culture studies, Smircich (1983). She suggested two broad modes of thought on organizational culture studies for analysis. She distinguished pure anthropological cultural studies (organizational cultures discussed as interdependent variables of material organizational actions) from organizational cultures viewed as a root metaphor (see also Bate, et al., 2000:p.198; Smircich, 1985).

First, a concept of organizational cultures from a material perspective is defined as part of the environment and a result of human enactment. Organizational culture is a kind of variable within a boundary of organizational material actions from an *instrumental perspective*. The concepts of organizational cultures are therefore broadly derived from the economic and material practices of organizations, in which an object or human artefact is intentionally made in organizations. This includes ***cross cultural and comparative perspectives and corporate cultures***. The details are as follows:

- **Cross-cultural and comparative perspectives**: These consider varied attributes in managerial and work practices and organizational attributes across countries. Culture is thus regarded as a background factor and explanatory variable synonymous with a country as an independent variable. For instance, Harbison and Myers (1959) stated that differing degrees of industrialization could be an extensive variable affecting organizational culture, such as belief, authority and leadership and so on, in organizational structure. It suggested that a different degree of industrialization among nations could also be viewed as a variable to determine an organizational culture from cross-cultural perspectives (Smircich, 1983).

- **Corporate cultures perspectives**: This perspective views a concept of organizational culture as an internal variable that is situated in one organization within the industrial, structural, systematic and interactive mechanisms, which are interplayed as adaptive mechanisms of organizations. These are associated with traditional organizational development study schools that are interested in organization structure, size, technology and leadership patterns, as well as subjective variables such as culture. Smircich (1983) presented the relationship between organization and cultural contexts with five variables: goals, administrative systems, sociocultural systems, production systems, technology and structure. All can be viewed as interdependent variables to form an organizational culture within certain material practices of organizations (Smircich, 1983).

On the other hand, the other concept of organizational culture is also discussed as *a root metaphor,* referring to an organization as an expressive form of human consciousness (Smircich, 1983). In other

words, it is a concept that organizational cultures are formed and shaped through everyday social interaction and intervention of humans as a *process* (Bate, et al., 2000; e.g. Schein, 2010). This is distinguished from material-based organizational cultures that are related to machines, organizations' adaptive systems and purposeful instruments of organizations. It is discussed in symbolic aspects of a concept of organization regarding actual human enactment. Smircich (1983) introduced two concepts and named these: ***organizational cognition and organizational symbolism***:

- **Organizational cognition:** An organizational culture as a set of cognitive assets such as systems of knowledge. Here, cognitive and material things, such as events, behaviours, emotions and shared systems of knowledge and beliefs among members, can act as unique rule-like manners (O'Higgins, 1980; Smircich 1983). Symbolic and metaphoric knowledge and belief are emphasized as concepts of uniquely shared cognitive subjects in networks between members. These, therefore, become characterized as means of a finite number of rules, or means of an unconscious logic in transferring necessary information and knowledge for a design project.

- **Organizational symbolism**: This comes from theories arguing that culture is a system of shared symbols and meanings, which originate from anthropology studies. Here, organization is viewed as patterns of symbolic discourses. Organization is, therefore, deciphered as a manifestation of subjective symbols that are shared with members through certain discourses that facilitate shared meanings and shared realities. This concept is, therefore, often concentrated on subjective aspects of organizations, such as leadership that can diffuse a shared subjective meaning, as this can help to shape interpretation of the different meaning of symbols.

Based on this, it is needed to consider how organizational culture studies are approached as related to the growing complexity of organizations and material practices. Traditional organizational studies still show limitations in discussing a generative process of organization, giving birth to new meanings in human interaction in organizations and ecological effects of organizational actions (Smircich, 1985), as well as its generativity of their material practices (i.e., designing process) (Krippendorff, 2011). Pondy and Mitroff (1979), adapting Kenneth Boulding's (1968) framework (see Section 2.1.4; also Scott, 1998), argued that emerging models about open and closed systems are still categorized by the level of complexity. Following this, Smircich (1983) believed that Pondy and Mitroff's cultural model could embrace human behaviours related to internal organizational actions, as well as dynamics of an environmental variable, by overcoming concerns about a certain way to accomplish an organizational object and the meaning of organizing itself. This consideration directs us to the notion of holistic inquiries in organization (McKelvey, 1982; Scott, 1998).

With this understanding, this thesis will take a further look at 'generativity' and evolutionary and generative aspects reflected in design rules and organizational logics with digital design principles in Section 2.3. Before the discussion, the next section will explore how significant large organizational culture studies are from international and cross-cultural perspectives in design studies.

2.3.4. Large Organization and National Cultures: the East and the West

This section explores how large organizational cultures reflect national cultures as sub-units of organizational cultures (Section. 2.2.2.1) and how significant the study is in design studies from international business perspectives, as related to relatively different organizational cultures in the East and the West.

Cross-cultural studies have been popular in the growing environment of international business. In particular, comparisons between Eastern- and Western-based organizations have been actively discussed due to significant conflicts in actual international work practices reflected in differences of work attitudes such as: ways to communicate; attitudes towards hierarchy and authority; and the norms for decision-making etc. (Schein, 2010; Brett et al., 2006).

As noted earlier (Section 2.2.1.3), cross-cultural studies are, in general, discussed in material-based organizational cultures. As such, it has greatly emphasized the material and instrumental aspects of international work practices; differences of work practices in inherent organizational cultures in different national cultures; the relationship between different countries' economic development and national cultures; and differences in organizational outcomes in different national cultures.

Regarding Eastern and Western differences in the ways groups work, Markus and Kitayama (1991) attempted to identify how an individual is perceived in each location. They concluded that the East is more interdependent on others, whereas in the West, an individual is perceived as independent of others. Likewise, there are also some differences of attitudes in workplaces: Western communication is far more direct and explicit, while Eastern organizations are likely to adhere more strictly to hierarchical manners in transferring significant information to management (Brett et al., 2006). In particular, East Asian business cultures (representing Chinese, Japanese, and Korean organizations) have been studied in much scholarly literature by focusing on the differences and similarities reflected in their work practices. Japanese styles focused on group harmony and social cohesion; Chinese business revolved around certain personal relationships, called Guanxi; and place great emphasis on respect for hierarchical relationships and obedience to authority for harmony. Yet each one also resembles the others in terms of cultural roots, such as their grounding in Confucius. This is still distinguishable from the Western values represented by Anglo-Saxon countries including the UK, the US etc., (Alston, 1989; Hofstede & Bond, 1988).

Hofstede's research attempted to scrutinize differences of organizational cultures in different nationalities in a wide ranges of areas: from economics and education to organizational attitudes in work practices (namely, a relationship between the Eastern Confucius culture and economic achievement (Hofstede & Bond, 1988); personal nurturing processes and organization cultures in teaching and learning in the East and West (Hofstede, 1986); and differences of organizational attitudes in actual work practices in the East and the West (Hofstede, 1994; Hofstede et al., 2010). Yet, in connection with this research, controversial issues have also been raised, especially in relation to differences of organizational attitudes because of ignorance of individual human members' psychological aspects in organizations (Spector et al., 2001).

However, Hofstede's research still has great significance as it has been adapted and replicated to other international studies. This is because it offers significant understanding of 'cultural relativity' by providing analytical and conceptual dimensions for other empirical studies (see also Section. 2.2.1.2), and it also considers cross-cultural approaches as a key research paradigm in business and management studies; this is unlike conventional international management research that borrows from other areas, such as organization theory, psychology or economics. Hofstede's research helps us to consider emergent universality as it looks for 'similarities' by identifying 'differences' (i.e., differences in nature: *emic*) and allows access to differences in degree (i.e., *etic*) (Usunier, 1998). This is particularly true for analysis of organizational cultures. His research employed ***artefaction*** perspectives (see Section 2.1.2), which broadly involves differences reflected in *organization structures* in paradigms of cross-cultural and corporate organizational culture (Hofstede et al., 2010; Usunier, 1998: p. 29: This will be further developed in Chapter 3 in setting the methodology).

Regarding organization structure, Hofstede's conceptual dimensions for analysis of organizational cultures underlined the differences between the desirability of centralization, controlling, formalization, and planning. These can impact on the structure of the artefacts as a symbol of an organization. Hofstede (2010), therefore, brought examples of the case of accounting systems as those organizational artefacts, such as GAAP, which is the generally accepted accounting principle in the United States. For Hofstede et al. (2010)

> "Accounting (as organizational artefacts) is said to be the language of business: this means that accounting is the handling of symbols that have meaning only to those initiated in business" (p. 317).

Based on this, Hofstede scrutinized relations between national culture and organizational cultures and revealed the distinct characteristics between Eastern and Western organizations, using four key dimensions in quantitative approaches: power distance degree of individualist vs. collectivist; degree of masculine vs. feminine and uncertainty avoidance; and two extended dimensions, i.e., long-term versus short-term orientation and indulgence vs. restraint (Hofstede, 1994; Hofstede et al., 2010).

The Eastern world, for example, countries of Chinese cultural background (Taiwan, Hong Kong, Singapore), Korea, and Japan is distinctively seen as "large power distance/low individualism/strong uncertainty avoidance" countries (Hofstede, 1994; Hofstede et al., 2010; Lee et al., 2000), whereas the West (USA, the UK, and Demark) features "small power distance/high individualism/weak uncertainty avoidance" dimensions (Hofstede, 1994; Hofstede et al., 2010; Lee et al., 2000). It can be summarized that the East uses 'controlling' organizational language, whereas the Anglo-Saxon dominant Western countries, such as the US and the UK, are characterized as 'less-controlling' (summarized in Table 2.2).

With those references, Hofstede's research results and conceptual dimensions have been replicated and developed in much research from management science to marketing studies, e.g., different strategic and decision-making approaches in new product development processes and marketing between East and West (Lee et al., 2000; Nakata & Sivakumar, 1996; Song & Parry, 1997).

Taking this into account, recent management science and marketing studies have focused largely on the influences of different business systems in the East and West, regarding the success of East Asian organizations in complexity-based electronic industry: Japan, South Korea, and countries of Chinese cultural background, by focusing on their organizations' material systems (Hobday et al., 2004; Hobday, 1995).

In summary, Hofstede's research outcomes have made significant contributions to developing international and organizational culture studies in the following two areas (Hwangbo et al., 2015a; Hwangbo & Tsekleves, 2014):

- First, the study focuses on relations between hierarchical structures of organizations and organizational cultures, which result in systems, i.e., bureaucracy, desirability of centralization, controlling, formalization, and planning etc.
- Second, Hofstede noted significant differences in organizational cultures between the East and West for further future studies. With this understanding, it allows us to consider how these differences in organizational cultures can be associated with organizations' design outcomes as the manifested artefacts.

Within this context, the following sections will discuss in detail how an organization is enacted for its material practices with a new product (i.e., approaches to managing design).

Organization culture dimensions		Characteristics in organizations	Nations (Hofstede Index)
Power distance	**Small power distance societies**	• Hierarchy means an inequality of roles, established for convenience • Subordinates expect to be consulted • Ideal boss is a resourceful democrat	Denmark (18) Germany (35) Great Britain (35) United States (40) Canada (40)
	Large power distance	• Hierarchy means existential inequality • Subordinates expect to be told what to do • Ideal boss is benevolent autocrat (good father)	Japan (54) Taiwan (58) S. Korea (60) Singapore (74) China (80)
Individualist	**Individual societies**	• Same value standards apply to all: universalism • Other people seen as potential resources • Task prevails over relationship • Calculative model of employer-employee relationsh	**United States (91)** **Great Britain (89)** **Canada (80)** **Denmark (74)** **Germany (67)**
	Collectivist societies	• Value standards differ for in-group and out groups: particularism • Other people are seen as members of their group • Relationship prevails over task • Moral model of employer-employee relationship	Japan (47) China (20) Singapore (20) S. Korea (18) Taiwan (17)
Masculine	**Masculine societies**	• Assertiveness appreciated • Oversell yourself • Stress on careers • Decisiveness	Japan (95) China (66) **Germany (66)** **Great Britain (66)** **United States (62)**
	Feminine societies	• Assertiveness ridiculed • Undersell yourself • Stress on life quality • Intuition	**Canada (52)** Singapore (48) Taiwan (45) S. Korea (39) **Denmark (14)**
Uncertainty avoidance	**Weak uncertainty avoidance societies**	• Dislike of rules • Less formalization and standardization	Singapore (8) Denmark (29) China (30) **Great Britain (35)** **United States (46)**
	Strong uncertainty avoidance societies	• Emotional need for rules • More formalization and standardization	**Canada (48)** **Germany (65)** Taiwan (69) S. Korea (85) Japan (92)

Table 2.2 National differences (adapted from Hofstede, 1994; Hofstede et al., 2010)

2.3.5. Overview

This section has explored the significance of organizational culture studies, which can affect different approaches to systemized, objectified and codified artefacts, i.e., design. The discussions began with an understanding of relativism to identify the meaning of differences underlined in organizational culture studies. It focused on the concept of difference from universal perspectives as a problem, so that understanding of relativity is important prior to studying organizational cultures.

Following this, the section noted that scholarly literature about organizational cultures and international organizations has discussed views of organizational cultures as units of systemized artefacts, i.e., macro- and micro- organizational cultures as per different levels of complex units. In fact, the concepts of analysis in organizational culture studies have been studied in two broad areas: a concept of organizational cultures from material perspectives, i.e., a kind of variable within a boundary of organizational material actions from an *instrumental perspective*, and organizational cultures in *a root metaphor* i.e., an organization as an expressive form of human consciousness.

On the basis of this understanding, it arrived at the point where organizational culture studies from cross-cultural perspectives have been studied in material-based organizational cultures. The studies have somehow reflected differences not only of work practices in organizational cultures, but also different approaches to complex system artefacts that are manifested by organizations. For this, the notable scholar, Geert Hofstede's (2010) research results was taken into account, using four major dimensions: *power distance, degree of individualist vs. collectivist, degree of masculine vs. feminine,* and *uncertainty avoidance*. The result, consequently, shows that there are significant differences of organizational cultures in the East and the West. This could provide analytical dimensions and constructs for this study.

2.4. Complex Organization and Managing Design

This section explores how an organization is enacted to meet its interests using its product and services. This provides us with a deeper understanding of how complex organization structures that form organizational cultures are associated with design for their products and services.

2.4.1. Complexity of Technology in Approaches to Managing Design

Returning to concepts of organizational culture (presented in Section. 2.2.1.3), notions of organizational cultures are not easily divorced from human material practices that give rise to the

complexity that fills all organizations and systems; and a process of design is to some extent constrained within the context.

Herbert Simon's (1996) definition of 'complexities ' or 'complex systems' contributes to broadly established theories about all kinds of human material practices: from economics (especially behavioural economics based on bounded rationality); operation management (Chang, 2014); design theories formulated by Norman (1988), Buchanan (2001), and Cross (2008); to neuroscience studies about digital algorithms of computer technology employing humans' neuro-mechanism (Kurzweil, 2013), as related to principles of complex systems and complexities (see Simon,1996).

Here, complexities and complex systems suggest one that is made up of a large number of parts that interact in a non-simple way as a whole. In other words, one being is composed of more than the sum of the parts. Simon's (1996) definition implies that all of our artificial worlds, including product and organization, are filled with those complexities providing the properties of the parts and the laws of their interaction as the properties of the whole.

In this sense, technology, organization, producing artefacts, and design are placed in one common ground when discussing human-made artefacts. Thompson (1967) stated that complexity of organization is the function of 'technology' as an intermediate, where those sub-parts interplay with the one as a whole entity. Perrow (1967) conceptualized and framed types of complex organizations and technology variables for analysis with two aspects. These were, first, types of problematic situations encountered in the works (i.e., level of exception) and, second, types of problem searching (un-analyzable vs. analyzable) related to producing artefacts. In accordance with the framework, organizations are to some degree formed along with varied degrees of technologies as independent variables, which result in a specific structure of the complex organization as related to its administration.

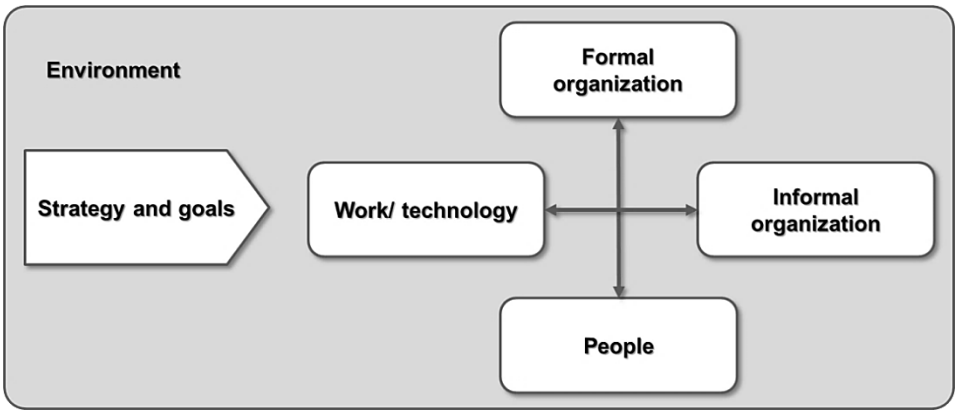
Similarly, Mintzberg (2005) stated that modern complex organizations are driven by technology, aiming to offer products or services, and so the instrumentally perfect technology has contributed to the desired outcome, especially in mass manufacturing. In light of this, Scott and Davis (2007) specified that technology helps materials transform inputs into outputs as the outcomes of an organization and that it is these that are carried out through the organization process. Therefore, the outcome is embedded in all symbolic and physical organization components:, such as machines; equipment to fabricate the product; technical knowledge; flow of information; and skills of participants etc.

With references to those relations between organization and technology in a process of artefact design, organizations conceiving 'technology' to produce 'artefacts' are closely related to the 'structure' that enacts the technology and the organization. This is because different types of complex organization

suggest how their individual members perform upon an object, either with or without the aid of tools or mechanical devices (i.e., technology) in a certain structural and organizational process of achieving a targeting object (Perrow, 1967; Scott, 1998). The functions of the complexity: such as the specification of positions; role requirements; procedural rules and regulations; value and factual inputs, therefore, play a key role in decision-making and function with a *'rule'* as to *'what ought to be'*.

Within this context, Scott (1998) with understanding of Nadler & Tushman (1997)'s discussion addressed the major elements of organizations producing their outcomes as consisting of five dimensions related to technology. These are: environment, strategy and goals, work/technology, formal organization, informal organization and people (see also Scott, 2007)**.** The details are summarized in Table 2.3.

It has been explored how complexity of organization is closely associated with complexity of technology in producing organizational artefacts. It offers a significant understanding that a process of design for an organizational artefact is hardly ignors complexity issues. As such, it is closely tied up with structure and how to produce and design an intended artefact. Based on this, the next section will discuss how an organization is enacted in producing an organizational artefact in general and explore how it is related to organizational approaches to managing design.



The essential elements of organization & details	
Environment	• **Surrounding of an organization in a specific physical, technological, cultural, and social environment to which it must adapt as an adaptive system** • It can be seen as a store of resources and source of opportunities and constraints, demands and even threats, including the clients, constitutions, or customers that the organization serves and the providers of resources it requires to do so
Strategy and goals	• **The choices that organizations make about which markets or clients the organization intends to serve, the basis on which it competes in its domain**; the distinctive way it seeks to provide its outputs. • The specific tactics the organization employs, and the output goals it sets for itself

Work/technology	• **Organization has performed in particular critical tasks effectively to transform the organization's goal into 'realities':**
	  • 'Work' refers to the tasks that the organization needs to accomplish given the goals it has set for itself. This includes character of the work flows and the level of interdependence among the parts of the organization
	  • Technology is the domain that can help one organization transform a materials into a viable output as a mechanism (i.e., transforming inputs into outputs) with given energy, so that the types of technologies applied varies depending on how/what to use for producing their artefacts: e.g., process centric or making and fabricating something

Formal organization	• **Organizations codify their ways of working and approaches to work to some degree explicitly. Those explicit elements, including human resource practices, the design of jobs, and the overall organization structure, are labelled as formal organization:** • This is seen in formal organizational hierarchy, as a boss and a set of subordinates placed in a series of subsystems
Informal organization	• **The emergent characteristics of the organization that affect how the organization operates, including culture, norms, and values, social networks insides and outside the organization, power and politics, and the action of leaders.** However, all of these are not explicitly captured in organization charts: • Herbert Simon (1996) argued that formal organization and hierarchy only existed in documents, and actual features of organizations are rather addressed in many those informal relations.
People	• **Organizational participants who contribute to the organization in return for a variety of inducement,** and so, in order to do so, the members have to use their specialized knowledge and skills: • Those are fit with the tasks they perform in organizations. So the relationship between individual members and leaders are often emphasized in managing and operating an organization

Table 2.3 Congruence Model of Organizations (adapted from Scott & Davis, 2007)

2.4.2. Enacted Organization and Controlling in Action

2.4.2.1. Necessity of controlling in organizations

There has been growing interest in evolutionary, open-natural model and metaphoric concepts of organizational cultures that emphasize human conditions and the generative aspects of human-made artefacts (Sections 2.1.4 and 2.2.1.3). However, organization in itself is underlined as a stable, rational and fixed system for their best governances. What is more, controlling and governance issues have been broadly discussed in a significant amount of literature as necessities in organization change, creativity and increasing flexibility for innovation (Hlavacek & Thompson, 1973; Amabile et al., 1996).

Those debates are, however, closely associated with the nature of organization logic that is expected, objectified, stable and precedent predictability-based rationality for best competitive operation (Yoo et al., 2006; Weick, 2004), whereby rationality-based organizations are optimized for maximised production, reducing any proportion of its costs (i.e., efficiency) (Scott & F.Davis, 2007; Rosenberg, 1976). For that reason, organizations employ multiple administrative rules explicitly to govern individual behaviours and to prescribe interpersonal relations within the structure (Scott & F.Davis, 2007), which give rise to 'hierarchy' for 'controlling' and 'planning'. In this sense, in organization studies the term 'hierarchy' has a narrower meaning to explain organizations' complexity consisting of the relationship between bosses and subordinates, in which the subsystem is subordinated by an authority. According to Simon (1996):

> Etymologically the word "hierarchy" has had a narrower meaning than I am giving it here. The term has generally been used to refer to a complex system in which each of the subsystems is subordinated by an authority relation to the system it belongs to. More exactly, in a hierarchic formal organization each system consists of a "boss" and a set of subordinate systems. Each of the subsystems has a "boss" who is the immediate subordinate of the boss of the system (p. 185).

Weber (2005) formulated the concept of hierarchy in organization studies in order to account for modern organizations, that is the principles of an office in the modern organization (i.e., an ordered system between superiors and subordination), which are found in almost all bureaucratic organization structures. The principles are significant and simple. As an organization grows it adopts a more complex division of labour among its operators, the direct supervision is necessarily elaborated and standardized to fit the organization, which forms a pyramid-like shape with formal authority flowing from the top to the operators (Mintzberg, 1983), and it is aimed at reducing all ambiguous accountability - e.g., reducing costs (Perrow, 1986).

2.4.2.2. Hierarchy for achieving explicit benefits

Hierarchy is the function of those *controlling* and *planning* in complex industrial organizations. *Controlling* is the means of channelling and coordinating behaviours of members to achieve specific goals (such as producing proper products for the organization) within a rationality based on hierarchical structures (Scott & F.Davis, 2007; Perrow, 1986). Within that context, hierarchy is the central form of power, and '*planning*' is the explicit type of *'controlling'* in the structure of the organization, in order to reduce all ambiguous accountability (i.e., *'uncertainty*'), such as resource issues (Hofstede et al., 2010), which are simply defined as perceptual controlling factors in organizations. The major features of relations amongst controlling, planning and hierarchy can be found in the characteristics of bureaucracy of organizations and configurations of organization structures.

Mintzberg's (1983) early studies focused on how organization design is configured with his basic analytical dimensions about the component parts of the organization, the people contained in each part, and how organization structure is differently characterized by the following five component parts of organizations:

- **Operating core**: people who are placed at the base of an organization to perform the basic work of producing the products and rendering the service. As an organization becomes complex and grows, the divisions in which operators work also increase.
- **Strategic apex**: parts of organizations(including people) that supervise operators as the organization becomes complex. They are in charge of those supervision jobs that control the complexity of full-time workers.
- **A middle line**: the more an organization grows the more complex managerial issues emerge, so that as manager, a middle line is created in order to manage the hierarchical authories between operators and the strategic apex. However, this level is sometimes characterized as an administrative type of labour, because they might only manage and administrate the basic work .
- **Technostructure:** as an organization becomes complex, standarization is requried for coordinating the work. These types of work are carried out by 'staff' who are also in charge of the administrative work. Yet, unlike middle line groups or the strategic apex, they are placed outside the hierarchy of line authority. This is called a technostructure. However, if this role is substituted to the staff group, controlling by managers can be weakened.
- **Support staff**: this refers to the staff members who are only engaged in simple supporting roles for a complex organization, such as staff in a cafeteria, mailroom or relevant, simple public relation jobs. This group is not related to standardization of complex organizations because those jobs are only related to indirect services.

Based on this, Mintzberg provided five basic types of bureaucracies of organizations and their features with regards to coordinating mechanisms and types of centralization and decentralization. These were: simple structures, machine bureaucracy, professional bureaucracy, divisionalized form and adhocracy (summarized in Table 2.4).

With reference to these five types, Mintzberg (1983, p.151) noted that organizational design selectively fits their situation. In other words, organizational design is achieved by organizational configuration that positions internal consistency among organizational design parameters, and this becomes compatible with its situational factors. Mintzberg exemplified 'machine bureaucracy 'as the typically large and modern organizations that appear around us, including: a national post office, security agency, steel company, an airline and a large automobile company, which are characterized as old, large, regulating, stable, simple and non-automated technical systems due to their standardized work process. The top level of this type of organization is mainly concerned with fine-tuning its own bureaucratic machines in strategic management from its own perspective to view them as large parts of an organization. So, the organization is characterized as a *'performance organization'*, rather than a problem-solving one; looking at *'perpetual conflicts'* that would be never resolved and only cease temporarily at that moment (p. 168). In this circumstance, middle levels are forced by complex formalization to prevent unpredictable deviations and conflicts in the performance of the organization.

However, one of the major dilemmas of those organizations is the conflict between efficiency in production and dynamic attitudes from the members (*human*) of the organizations doing the work (Perrow, 1986; Perrow, 1986), as those 'rationality-based organizations' lack understanding of human consciousness (see also Section 2.2.1.3).

Structural configuration	Coordinating mechanism and key part of organization	Type of centralization
Simple structure	Direct supervision led by strategic apex	*Vertical and horizontal centralization*
Machine bureaucracy	Standardization of work process led by techno structure	*Limited horizontal decentralization*
Professional bureaucracy	Standardization of work skills led by operating core	*Vertical and horizontal decentralization*
Divisionalized form	Standardization of outputs led by middle line	*Limited vertical decentralization*
Adhocracy	Mutual adjustment driven by support staff	*Selective decentralization*

Table 2.4 Types of structural configuration of organization designs and the features (Mintzberg, 1983)

2.4.2.3. Enactment of organization and product as output

Based on the above understanding, it is important to understand how an organization is enacted in creating and generating its output (product and service). The relationship between an organizational

structure and its outcome (and output) has been discussed in engineering design and management science, e.g., sociotechnical structures and human factor engineering (Perrow, 1983; Adler & Borys, 1996). However, in organization studies, organizational outcomes and outputs are accomplished through enacted organization-environments. The concept of ***enactment*** was introduced to explain the abstraction of organizational mechanisms driven by a series of human decision-making: the process of enacting in organizations is referred to as subjective interaction situated in objectified processes. Weick (1979) (cited in Scott 1998: p. 140) contended that enacted organization-environment does not correspond with how it is perceived.

Scott (1998, pp. 139-148; note also Section 2.2.3.1) came up with a cycle of interdependence of organization-environments by looking at the enacted mechanism that contains subjective and objective characteristics of organizations. Scott (1998) broadly adopts Wieck's (1979) and Mintzberg's (1971) arguments, as related to contructive organizational aspects, whereby organizations are not fully perceptual or reacted but are actively constructed or enacted by members (i.e., people). So, a concept of an enacted environment in an organization is not necessarily synonymous with a perceptual organizational environment. Decisions in enacting processes are, instead, made abruptly by participants and managers with superficial verbal brevity, concealing rationality subjectively by interacting with surrounding perceptual objects. This idiosyncratic and fuzzy mechanism is presented with the cycle of interdependence: **organization-environment relations** that include (Scott, 1998, p.143):

Organization structure (note Table 2.3 on formal and informal organization dimensions): These begin to understand how organizations approach their outcomes and output to be produced. It is broadly divided into two parts: normative structure and behavioural structure (Scott, 1998). Normative structure includes values, norms and role expectations so as to constitute a relatively coherent and consistent set of beliefs and prescriptions governing the behaviour of people involving an organization, which can be called a 'formal structure' (see also Table 2.3; ibid.). On the other hand, behavioural structure is said to be activities, interactions and sentiments that exhibit some degree of regularity such as large patterns or networks of behaviours of people in an organization. Major examples found in behavioural structure are '**power structure'** and **'socio-metric structure'**, of which two factors affect certain patterns of sentiments amongst people of an organization: whether or not members tend to be encouraged to carry on actual work, as it broadly forms informal organizational aspects (Table 2.3; Scott, 1998: p. 19). The major issues of this dimension are the two-part organization structure, which are neither necessarily independent nor identical, yet are interrelated, so that even if normative structure imposes strong regularity on behaviour, parts are not necessarily dependent on the rules.

Domain definition: This subset of an organization's environment, or a domain of an organization, is associated with the range of products or services that it offers and the types of clients or consumers it serves, which means the site where an organization interacts with an organization's goal (Scott, 1998). For instance, if an organization wants to open an automobile repair shop, it claims to offer the automobile repair service and this is acknowledged by others such as clients, distributors and regulators as an objective definition. Through this, an organization functions and acts in a selected domain that is objectively described about the organization's function and goal. Based on the selected domain, an organization selects and determines what outcomes (i.e., product and services) are going to be produced and delivered for certain types of customers. So, the definition of a domain of an organization is important as it affects the subsequent decision-making process through its information transfer flows (Scott, 1998).

Information system: In discussion of new digital artefacts design, it is crucial to understand the design practices can be regarded as representative organizational knowledge creation activities, which is accomplished by a collection of adequate information and the processing. Although terms, knowledge and information are interchangeably used (Nonaka, 1994; Nonaka, 2007)the notions have been discussed in clear distinctions in knowledge management, organization learning and innovation studies. Information plays a role as commodity to yield knowledge; so that it is mediums or materials in flow of message to create knowledge; whereas knowledge refers to the beliefs and truths that are being in particular stance and actions heading to some end (Argyris & Schon, 1996; Nonaka, 1995). In particular, the conception of information and knowledge is significant to discuss digital innovation and creating new digital product; i.e. creating something new for digital innovation. Because creating new digital artefacts is matter of how to coordinate, assimilate and recreate new knowledge and meaning of a digital artefact by using heterogeneous, decentralised and dynamic knowledge creation zones. It is therefore rather issues of how to use and optimize existing networks by redistributing control and how to deal with the knowledge coordination in order to generate the new meaning- i.e. generativity (Lyytinen, et al., 2015; Yoo, et al., 2012).
In this sense, understanding of information processing at an internal organization is addressed first. Information system is designed according to selected domain definitions of organization or product and services. This gives rise to an attention structure that helps to determine what people pay attention to in varying locations and what is to be assigned to them throughout specialized units and routines in the organization structure (Scott, 1998). It is conceptualized as the reports, statistics, facts, or information that are regularly collected, and their pattern of transmissions (Pfeffer & Salancik, 1978 cited in Scott, 1998: p. 141). The process of collecting information necessarily takes time and attention of organizations, because it is a major means of reducing organizational uncertainties, and so the attention structure of the organization is determined by collected information (This will be further discussed in Section 2.2.2.3 on formalization).

Attention structure, enacted environments and objective environments enacted by conceptiual brevities: the idea of attention structure was introduced with regards to theories on decision-making. This contributed to creating the enacted organization-environment. This stated that decision-making in organizations is related to attention or search, rather than choice, due to the controlling elements (time and organizational capabilities) that constrain and structure work practices. Rationality of decision-makers is bounded by those elements (Scott, 1998). In a process of search and structure attention, it is often concerned with *scarce attention* allocation, because not all organizational elements are attended to in rational way; and there are too many signals to be received for decision-making; consequently, organizations are seemingly rational (March, 1994 cited in Scott, 1998: p. 140). In fact, attention structure is rather conceptualized in organizations as brevities in written and spoken means provided by superiors in abrupt and superficial ways during meetings and scheduled and unscheduled information transfers (i.e., conceptual brevities) (Mintzberg, 1971,1973 cited in Scott, 1998). Through this, attention structure contributes to creating enacted and objectified environments towards outcomes and outputs.

Outcomes and outputs: As noted in the previous sections on artefacts (see Sections 2.1.2 and 2.2.1.1.), all of above enacted elements act interpedently to produce organizational artefacts and reflect the organization as a manifestation, i.e., outcomes and output. In this sense, concepts of outcomes and outputs need to be distinguished. Outcomes are results, and outputs are the final ones produced, such as goods and services. Thus, outcomes still reflect the joint product of organizational performances and environmental responses because outcomes are not *fully* the result of measures that are based on 'perceptions' and perceivable information deliverables, such as statistical analysis and reports (Farjoun, 2010; Scott, 1998). It is caused by all the multiple environmental factors of organizations (Scott, 1998) (this distinction will be reconsidered for theories of platform strategy as 'organizational design outcomes' in Section, 2.4.3.).

It is important to note this cycle of enacted organization-environment for organizational culture studies that emphasize human enactment, rather than those that view organizations as objectified material artefacts. After theories on open system organization were introduced (see also Section 2.2.3.2), analysis for organizational culture studies has, in fact, considered human enactment from interpretative perspectives, with regards to the strategic management of organizations in both material-based and root metaphor approaches (Smircich, 1983; Smircich & Stubbart, 1985).

Accordingly, the following sections will discuss how an organization is enacted in approaches to managing design and producing products which contain uncertainties.

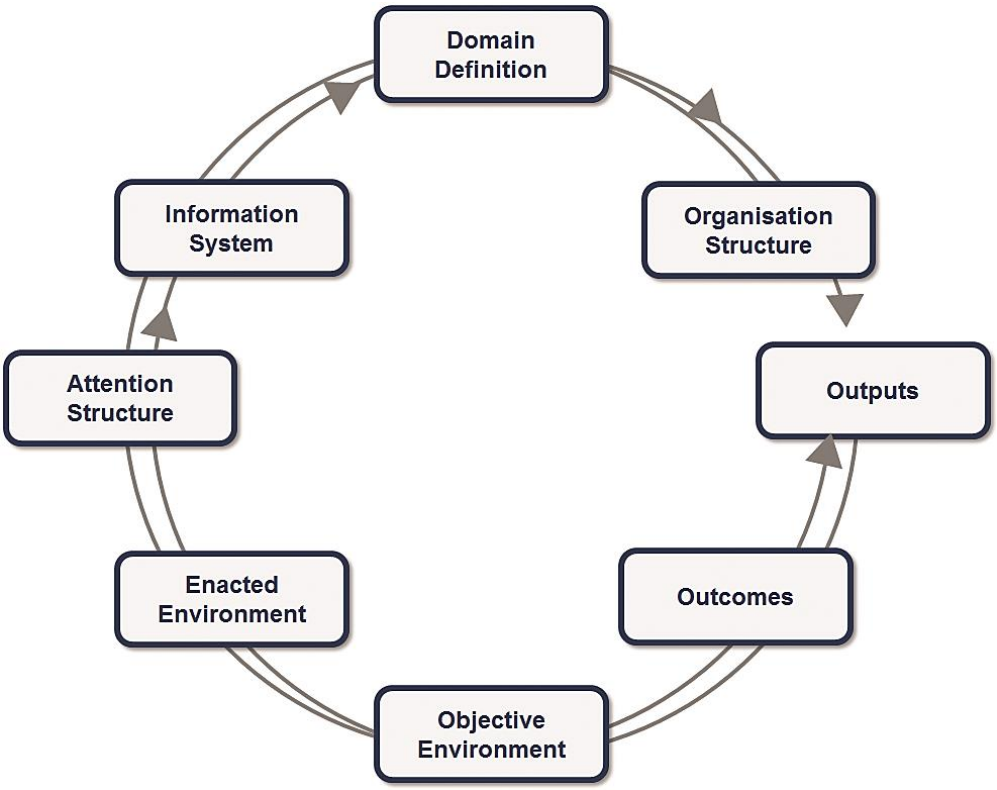


Figure 2.2 The cycle of interdependence organization-environment relations (Scott, 1998)

2.4.3. Overview

This section explored the detailed mechanism of relations between organizations and design practices as complex systems with the discussions of the causes of complexity in organizations and managing their material practices. Organizations deal with different degrees and levels of complexity of technology. This likely affects approaches to managing subsequent material practices in organizations through information transference and knowledge exchange between members of organizations (people).

Approaches to managing design can be the manifestation of how an organization 'controls' their actions of material practices. But, controlling is somehow necessary to organizational language and that the hierarchy of an organization's structure controls all perceptual conflicts by managing ambiguous accountability (i.e., uncertainties). Planning and formalization for clarifying the plans are the organizational languages that are used to reduce those surrounding uncertainties in organizations' material practices. In order to clarify the relations, it was introduced the cycle of relations between organizations and environments generating organizational outcomes and the outputs in enacted organization structure: interdependence in organization-environment relations, suggested by the

notable organization study scholar, Richard Scott (1998). The basic understanding of the mechanism will be applied to build and develop a theoretical research framework at the end of this chapter.

2.5. New Digital Products and Service Design in Organizations

New digital products and services are designed within organizational contexts and it is important for organizations to capture their opportunities to generate the most competitive outputs. Yet, design rules and principles in digitalizing product and service design, to some extent, differ from traditional ones in new product and service development. To understand this, theories on design rules and principles in new product development are considered.

2.5.1. Uncertainties vs. Risk in New Product and Service Design

2.5.1.1. New products in managing uncertainties

Initially, it is important to note that new products and services are the most accountable assets for an organization to earn its benefits by reducing its uncertainties (Yoo et al., 2006; Weick, 2004). In much scholarly literature, product is designed and produced in a series of processes meeting multiple demands emerging from inner and outer organizations. To achieve this, organizations, in principle, have focused on production of large volumes of standardized products that can satisfy multiple bodies. By doing so, an organization reduces varying levels of unprecedented uncertainties that the organization faces, so that new product and service design can be regarded as a competitive asset for an organization in order to sustain its business (Yoo et al., 2006; Weick, 2004; Ulrich & Eppinger, 2012). In other words, organizations have thus aimed to achieve new opportunities resulting from uncertainties with new products (Boland & Collopy, 2004), and so product design represents a major competitive element of manifestations of an organization as the tangible asset (Karjalainen & Snelders, 2010).

In this sense, as for the relation between uncertainties and new opportunities in new product and service design, a simple principle is therefore drawn. As new product is required to be new, novel and unique, it should embrace market or technological demands for uniqueness. This results in increasing uncertainties because the new product design should occasion new learning and new knowledge for the novelty and the uniqueness (Ulrich, 1991; Duray et al., 2000; Sanchez, 1996) (the principles will

be discussed in more detail in Section 2.4.2.). The more new solutions required with a new product (or service), the more knowledge about new technologies and markets is required, rather than existing knowledge or existing solutions that have already been used. In other words, newly categorized products and services can be said to be ones that overcome all of the uncertainties that an organization faces (Ulrich & Eppinger, 2012, p. 36).

2.5.1.2. Distinguishing 'uncertainty' from 'risk'

To understand the relationship between newness in designing and uncertainties, it is important to distinguish the concept of uncertainty from risk. The differences between the two terms have been however discussed in scholarly literature on organization, management, economics and philosophical contexts in explanation of organizations' material practices.

At first, philosophical literature on pragmatist theory distinguishes uncertainty as parts of the pattern of inquiry and a process of problem-solving process. Uncertainty is defined here as placed right on the boundary that lies in between 'ambiguities'. Not all problems are perceived and there are 'indeterminate situations': it can raise a question on the problematic situation implying anticipatory solutions as a precognitive step. These are conceptualized as symbols: such as interpretation of texts; writing of texts; interpretation of experience; statements; formation of character; thoughts; and actions (Dewey, 1938; Dewey, 1948; also see Argyris, 1985).

Taking this concept, it is important to note that the meaning of uncertainty can be significantly different from 'risk'; although the two concepts are often synonymously used in literatures on human material practices. For instance, Rosenberg (1976) noted that organizations in the market mechanism tend not to look for *inventions* because it is somehow biased due to the *uncertainties* that cause *'cost'*, rather than incentives.

Yet, the distinction between two terms has been already discussed in economic theories rooted in Keynesian school with a focus on whether or not it is able to be measured. The school notes that uncertainty is not known what an event is going to happen; whereas risk can be calculated the probability through looking at each possible contingency (Chang, 2014). Likewise, notable economist, Frank Knight (1921) noted risk is underlined in measurability, objectivity and insurability of probabilities, whereas uncertainty is featured in un-measurability, subjectivity and un-insurability (Langolis & Cosgel, 1993; Ilevbare, 2013). Hence, concerns over perceivable costs in organizations – which Rosenberg(1976)addressed- is the matter of 'risk' management. For that reason, the two notions have been controversially discussed as being concerned with those dilemmatic concepts that are barely framed and managed with perceivable applications in organization and management studies (Ilevbare, 2013).

However, returning to design theories, 'new opportunities' for 'novel' products that are placed in new categories, come rather from un-measurability, subjectivity and un-insurability-based 'uncertainty',

which is situated neither in ‘new generation’ nor ‘improved nor extended products’ (Ulrich & Eppinger, 2012; Section 2.4.1.1). New generation and improved (revised) products are addressed in exploitative approaches to ‘risk management’ in new product development. In fact, much of the literature on traditional new product development principles explicitly discusses the emerging risks in allocation resources and expected financial benefits in product portfolios (Urban & Hauser, 1980: p. 521).

Hence the next section will discuss how new product design is likely to be conceptualized and managed in organizational contexts, as related to managing uncertainties.

2.5.1.3. Product design as formalized output

When considering that product is a manifestation of an organization in response to its uncertainty (Section. 2.5.1.1), it leads us to a question how new product is conceptualized and coordinated in an actual organization. With regard to the relations between product and uncertainty in organizations, organizational approaches to new product design are conceptualized in a series of ‘formalization’ activities in organizations.

Assuming that organizations are based on rationality, modernized organizations have been developed so as to minimize cost and maximize profits for efficient production. As such, uncertainties that affect the mechanism are always the major concern for complex organizations in implementing complex systems and in designing complicated artefacts (Thompson, 1967; Scott, 1998; Perrow, 2011;Zammuto & O'Connor, 1992). Organizations are thus articulated as purposeful and established mechanisms to achieve their goals, which engage in an on-going process of evaluating their purposes, questioning, verifying and redefining the manner of interaction with their environments by providing goods and services that can maintain a viable market. They are carried out with effective alignment tasks that encompass countless decisions and behaviours at several organization levels (Miles et al., 1978). For that reason, formalization is underlined as the basic organizational language to deal with ‘uncertainty’ within the mechanism.

The notion of formalization can be found in Max Weber’s (2005) classic literature on the bureaucracy of modern organizations. The principles of fixed and official rules are carried out by administrative regulations in a certain hierarchical structure, and the management of the modern office is based on the written documents (or files) preserved in an original and draft form (see also Adler & Borys, 1996). In other words, formalization is an organizational attempt to make behaviour more ‘predictable’ by standardizing and regulating it, permitting stable expectations between people in an organization regarding other members’ behaviour under specific conditions. As such, it serves an explicit, visible, rational and objectified structure that makes the definitions of roles in subjective, fuzzy and

inconsistent actions of people in organizations (Scott, 1998; Adler & Borys, 1996). In this sense, formalization has the potential to contribute to efficiency and facilitating tasks of workmanship by reducing both role conflicts and the '*ambiguity*' that creates feelings of alienation and stress in large-scale projects, which can lead to costs in rationality-based organizations (Scott & Davis, 2007; Scott, 1998).

In this sense, organizational artefacts including machines, organization structure and product can be differently manifested by different types of formalizations of organizations, as related to organization structure aligned with the flow of information, of work and of roles and responsibilities of the divisions (Mintzberg, 1983; Scott, 1998).

In a similar sense, a feature of organizational formalization in design studies is viewed as an indicator that can speculate features of design practices in an organization. The principle comes from the theory on interactive artefacts in the area of participatory design, which is the concept of how humans as users interact with machines, and how system design is utilized in workplaces, such as the use of equipment and its usability. This began with emergent concerns about computerized automation systems, so that in this circumstance designers should become like technical consultants and users become like prospective experts who can engage in design processes (Suchman, 1994; Rheinfrank et al., 1992). To do so, it is important to consider how an organization that designs products and services enables or hinders the building of an interactive artefact for the better usability of users, and for better communication between users, design professionals and organizations. Adherents to this theory, therefore, focus on organizational design languages and design semantics from an *evolutionary perspective* (Adler & Winograd, 1992; Rheinfrank et al., 1992)

In line with this, Alder and Borys (1996) addressed two different features of formalization that affect approaches to products that are designed and equipped in organizations (Alder and Borys's term 'product design' is here focused on equipment in work places and system design). The principle is simple: if utility of a product features 'enabling' usability, it is enhanced by 'two way communications', enabling formalizations with organizations. Thus, it can return to facilitate usability for users, whereas 'coercive formalization' is limited to 'one-way communication' and so the characteristics of the product are designed for de-skilled works (summarized in Table 2.5). It implies that software programmes and technology, called an organization's 'know-how', are rendered and objectified in organizations' formalizations, along with their underlying bureaucratic structure (Scott, 1992; Adler & Borys, 1996).

In this sense, formalization can, however, inhibit 'creating' something new (i.e., product and services) due to its given nature. The routine, regulative, and administrative being that is incorporated into the 'formal structure that views all those 'uncertainties' that arise from something new as 'bias', so that it can negatively impact organizational creativity and innovation' (Rosenberg, 1976; Thompson, 1965).

To sum up, formalization is the centre around which organizations control surrounding uncertainties. However, it refers to an approach to managing design practices that can be affected by the explicit characteristics of formalization, which conceal the organization's implicit hierarchical and structural manners. As such, it can affect approaches to complexity undergone in the product design process. In order to come closer to a much deeper understanding of relations between new product and approaches to managing design in organizations, the next section will discuss design rules and their shifting principles in digital product development that are situated in incremental uncertainties.

Product design approaches in utility	Coercive formalization	Enabling formalization
Repair	• Deviation from standard procedure is assumed as suspect • Procedures are designed for superiors to observe subordinates' actions in compliance rather than helping them • Handbooks are used to prescribe methods to perform the task within a controlled standard	• Facilitate employees to respond to real work contingencies • Breakdowns indicates improvement of organization problems by a philosophy of collaborative learning
Internal transparency	• Procedures are just formulated as flat assertions of duties • Procedures for their supervisors to sanction punishment in the case of deviations	• Users able to look at processes regulated by explicating its key components • Checking processes codify best-practice routines • Users understand the underlying theory of this process by clarifying the rationale of the rules and feedback on their performance • Users able to assess their performance against historical standards
Global transparency	• Subordinates try to minimize a risk • Management concerned with acceptance or rejection under full control	• Wide range of contextual information is provided to help employees • Able to interact creatively with the broader organization and environment, • Procedures help them to understand their own tasks rather than control
Flexibility	• Manuals determine the specific sequence of steps • Manuals force employees to ask for the superior's approval • Only supervisor authorised for a deviation by the manual • Changes defined as risks • Users have neither the knowledge nor any incentive to facilitate change	• Deviations and changes are assumed to be learning opportunities • Closer analysis and manuals help engineers to take short-cuts without resorting to work-around

Table 2.5 Coercive and enabling formalization and product utility (adapted from Alder & Borys, 1996)

2.5.2. Design Rules in Creating New Products and Services

2.5.2.1. Design rules in hierarchy

The term, design is obviously distinguished from pure creative artwork. Design is based on human ego as pure creative artworks have been done, but this is also rather posited in an intermediate position between science and pure humanity-based approaches (Sections 2.0. and 2.1). Because of this,

methodological approaches to design are often concerned with more sequential and structured analysis that is focused on system itself (reductionist perspective) in linear processes of inquiry (inductive, mathematical scientific, positivist and statistical methodologies) (Broadbent, 2003). This is because product design activity is, for instance, still required of and underlined in mathematic-like design flow that uses an iterative process to reach the detailed design of products that are conceptualized through new emergent concepts (Pugh, 1991). For that reason, design practices in organizations have been carried out under top-to-bottom approaches that constantly repeat stages, concerning the multi-functions of organizations such as manufacturing or selling, implementation of design, subsequent improvement, and disposal within the concept of physical design (Hollins & Hollins, 1991). In short, Alexander (1964) noted that design is the logical process to solve problems with certain structural rules, which people ought always to design with a number of nested, overlapped 'form context' boundaries in mind.

In this context, much management science literature has dealt with the design rules and logics that are aligned with organizational tasks and structures with modularity theories: that is, features of hierarchy in a structural sense of modular designs for products and modular designs for organizations that create products. Sanchez and Mahoney (1996) and other groups (Schilling, 2000; K.Pil & K.Cohen, 2006; Langlois, 2002; Ulrich, 1991; Baldwin & Clark, 2000) studying about the modularity theories defined the concept as follows:

> "Modularity is a special form of design which intentionally creates a high degree of independence or loose coupling between component designs by standardising component interface specifications. " (Sanchez and Mahoney,1996; p.65; see also Baldwin & Clark, 2000; pp.63-64)

On the basis of this concept, in fact, the degree of coupling between component designs and between organization design has been discussed as coordinating and creating information for interfacing component specifications, which is closely associated, not only with structuring the information in an organization, but also configuration of organizations (Sanchez & Mahoney, 1996).

However, the emphasis of the theory is, in particular, on the basic concept of design: relating to activities of the cause and the effect of human's problematic situations, design is 'planning' to solve the problems in 'structure', in order to 'function' it with a devising 'product' (Baldwin & Clark, 2000). The theory provides many detailed principles of design in product development relating to specific organizational design practices. Product is built up by comprising the basic functional parameters that pertain to functional domains (Clark, 1985). For instance, if a designer plans to design a cup with CAD (Computer Aided Design), the design of any artefact consists of a string of 0s and 1s on a computer screen, and the nested 0 and 1 framework would shape the strings that varied within the

class (design parameter) such as descriptors of a cylindrical shape, handle, walls and caps etc., (Baldwin & Clark, 2000).

These structural principles of design practices in new product development have been accounted for in modularity theories using feasible languages at the product level: the relations among component; module, architecture and product; i.e., almost all systems are regarded as modular to some degree (Schilling, 2000; K.Pil & K.Cohen, 2006; Langlois, 2002; Ulrich, 1991). In this theory, all systems (product) are defined in accordance with the degree of coupling between components. The 'rules' of the system architecture, whether modules interact with other modules, determines interdependently if it is enabled or prohibited with the mixing and matching of the modules (Simon, 1962; Schilling, 2000).

In short, this nested design parameter shows a form of hierarchical structure aligned with its (organizational) decision-making processes that chooses several solutions hierarchically derived from design problems (see also Marples, 1961). In other words, the structure of decision forms design parameters and the structure is the task structure to motivate design further, which results in a particular final design (Balbontin et al., 2000).

2.5.2.2. Absorptive capacity in creating new products and services

Design as creative practice

Design is often regarded as a creative activity (Cooper & Press, 1995). Design practice is engaged in creative processes and this is processed with visualized concepts to deal with what has not existed before (dti, 2005). Consequently, designers that are involved in design practices are referred to as professionals who have 'creativity' and 'problem-solving' capabilities, optimizing their intuition and exploration (Cross, 2008). However, understanding of basic rules of design, and design practices in creating new *products and services* are not purely led by those creative individual designers, but rather undertaken in a complex organization structure aligned with its hierarchical decision-making processes. This subject has been addressed in psychology and management science literatures.

Creating observable products constrained in organizational contexts

In psychology theories about organizational creativity, debates on a collection of individuals' creativities generating a product in an organization are closely associated with issues of complexity. The basic assumption is that creativity processes are necessary to solve constant and increasingly complex problems in modernized society involving varied and ill-defined problematic situations, as technology applied to the society is advanced (Simon, 1967): trial and error processes are essential to solving these problems.

However, the central concern of *product* generated as solution is that it is created through a collective set of evaluations by its observers. All created products are necessarily witnessed and examined by observers to answer whether or not the quality of the product is creative and useful. It implies that all creative ideas result in observable products that are necessarily judged, assessed or measured by appropriate observers, and the product is an indicator (Amabile, 1983; M.William & Yang, 1998). As such, an individual's creativity for developing a new product is difficult to separate from his/her social and historical milieu, including physical surroundings and cultural factors, such as early socialization, gender and birth order (Woodman et al., 1993; Amabile et al., 1996). It suggests that creative individuals not only produce ideas and communicate them to the field but they also assert them within the given historical and social contexts that require certain discoveries for the given context (Amabile et al., 1996).

New product design and complex knowledge creation

In line with this, organizational design practices for the development of new products and services are, however, considered to be highly complicated and logical processes because they require specific disciplines that rely upon technological knowledge for its viability (Pugh, 1991). In this sense, in new product development and design, an organization's creative capacity is synonymously used with its cumulative knowledge for problem-solving and the organizational capacity for learning and assimilating the knowledge, i.e., absorptive capacity (Cohen & Levinthal., 1990). An organization's core capacity for problem solving and learning relevant knowledge is accumulated in an organization's 'cognitive structure' through remembering and storing processes. What is more, when learning knowledge and communicating information in an organization, *a priori* memory plays a significant role in enhancing the problem-solving capacity, fostering its accumulative memory of what has been learned before. In creating complex product output (or service), knowledge diversity (heterogeneous types of knowledge) and cross-functional organization structures are therefore vital to foster best tacit communication between those diverse bodies with in-depth knowledge, i.e., individual professionals who are specialized in specific disciplines (March, 1991; Cohen & Levinthal., 1990).

In this sense, actual design practices and processes are necessarily structured to utilize certain design tasks and to function each design parameter in parts of a product. In order to accomplish complex product (and service) design, an organization learns new knowledge and accumulates it. Thus, the competitiveness of an organization's new product and service design is the result of the degree of accumulated knowledge of new technology or learning capacities. An unfulfilled gap in organizational capacities causes *uncertainties* for an organization (Ulrich & Eppinger, 2012). In fact, in creating new products (or services), different levels and extents of knowledge of technology and product architecture are required (Hobday, 1998; see also Table 2.6): the more complex and unique an

artefact it intends to create, the more uncertainties increase in the development of that new product. This is because it employes unique knowledge that has been little addressed or used , rather than adapting and revising existing knowledge (Cohen & Levinthal., 1990; Ulrich & Eppinger, 2012).

The principle is also discussed in modularity theory on new product development (see Section 2.4.2.1). New product development either refines new concepts or extends core design concepts derived from existing designs, in relation to the core concept of product design and component interaction in product architecture (Henderson & Clark, 1990).

Technology types	Description	Examples	Types of product development process
Low technology	Products rely on well-established technologies. These can be large or small in value but no new technology is required at any stage.	**Roads and simple buildings**	**Generic Market-Pull Products** **• Process intensive** **• Technology push** **• Platform** **• Process intensive** **• Customized product** **• Quick build product**
Medium-technology	Products incorporate some new features but most technology is available, as with new models of existing products.	**Most existing technology that have been already addressed**	
High technology	Products consist of mostly recently developed technology.	**New super computers and intelligent buildings**	**Complex systems**
Super High technology	Products, which depend on the development of new artefacts, skills and materials, are fairly rare and depend on emerging technologies. They involve extremely high levels of uncertainty, risk and new investment	**Spacecraft and intelligent defence systems**	**High-Risk**

Table 2.6 Technology types for new product development (adapted from Hobday 1998; Sanchez & Mahoney, 1996; Ulrich & Eppinger, 2012)

An organization's capability is therefore significantly rooted in absorbing relevant knowledge to create new product design. To design innovative products, radical learning is needed about module (component) interaction and configuration within product architecture and their in-depth functions, in order to develop new forms of product architecture leading to new product design (i.e., radical innovation) (Henderson & Clark, 1990; Sanchez & Mahoney, 1996) (see Figure 2.3). It indicates that the level of newness of product design that impacts on sociotechnical change is how an organization absorbs its capabilities in accomplishing radical learning, which can create new forms of product architecture and design (Sanchez, 1996; Sanchez & Mahoney, 1996).

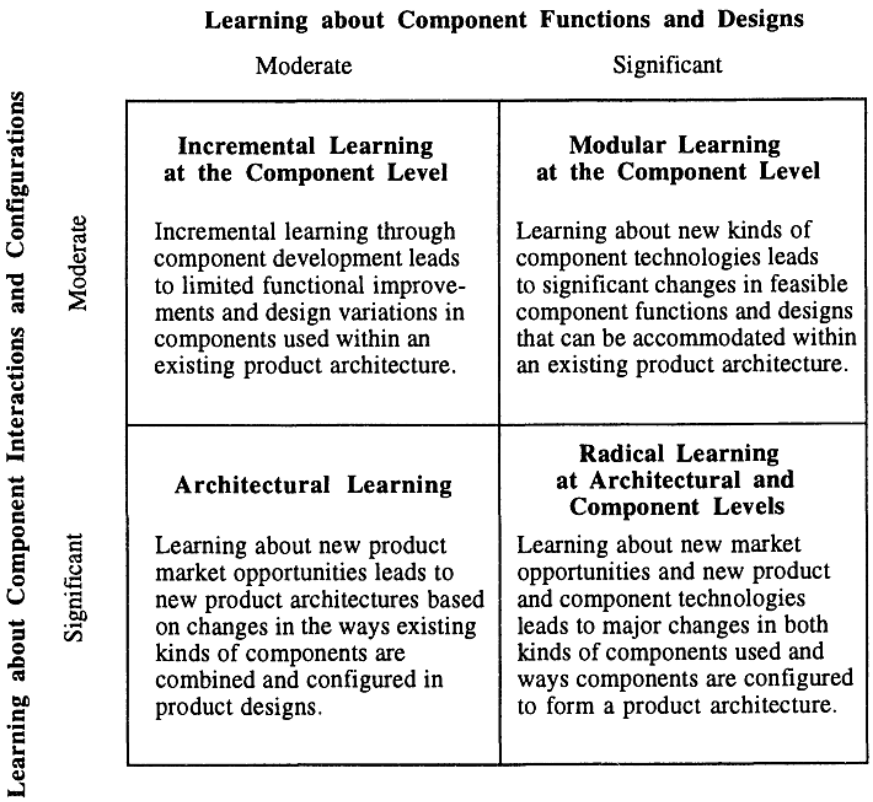


Figure 2.3 Modes of learning in product creation processes (Sanchez & Mahoney, 1996; p.69)

New product design and organization structure in uncertainty

Following on from this, creating new product design is closely associated with the relationship between levels of coupling in product architecture and managerial coordination of organizations. Tightly- coordinated design processes and organizational structure result in tightly coupled component configuration and interaction at the component level with less consideration of interaction with product architecture as a whole, i.e., a reductive approach. Whereas, a loosely coupled product architecture and design allows for organizations to evolve in more self-governed ways, rather than 'hierarchical manners', i.e., a holistic approach. Organization structure also corresponds with loose-coupling to solve continuously changing problems occurring in the loosely coupled product architecture design. For instance, software design is characterized by the separation of action of modules and of logic as to how the modules act. This enables designers to focus on their own specialty independently, by minimizing coupling in the design process. Conversely, this suggests that 'loose-coupling' organizational structures can enhance the problem-solving capacity to respond to constantly changing problems (Sanchez & Mahoney, 1996;p.67). In this connection, scholars who write about the modularity of product design suggest the degree of user participation opens organizations to external design participants (i.e., customer involvement). By doing so, organizations

can create ‘fabricated or designed new products’ that embrace heterogeneous demands from users by absorbing ‘new knowledge’ and ‘new learning’ from them, rather than simply assembling or adapting existing knowledge within an organization (Ulrich, 1991; Duray et al., 2000; Sanchez, 1996).

However, as noted above in terms of the modularity and new product development theory, more radical learning in loose-coupling structures (product and organizational structures) to create new product design implies an increase of organizational uncertainties. Radical learning has been little attempted before and an organization is exposed to risks in adaption of its capacity (Cohen & Levinthal., 1990; Karl T.Ulrich, 2012).

In relation to this, March (1991) examined two types of organizational learning that should be combined in organizations for innovation and ambidexterity of ***exploitation and exploration***. On the one hand, it contains the effectiveness of ambidexterity between those ways of organizational learning; on the other hand, the study also implied that organizations capture new opportunities situated in the uncertainties and diversities (heterogeneity) in closed and open systems, in order to create its new product and enhance its learning capacity. *Exploration* allows flexibility, discovery, and innovation by adopting play, search variation, experimentation, and risk taking (less uncertainties avoidance), whereas *exploitation* is closely related to things concerning refinement, choice, production, efficiency, selection, implementation and execution, and is more concerned with risks. However, although exploration can lead to innovative and creative outcomes, it is time-consuming, abstract and less accountable and so is less effective than exploitation. As such, the balance of ambidexterity between exploration and exploitation in organizational learning is seen as a paradoxical relationship (March, 1991; Andriopoulos & Lewis, 2009).

To conclude, in creating new product and service design, organizational capacity refers to how an organization takes its uncertainties and embraces them in its learning process. In other words, to create new products and services that can impact on sociotechnical change means that an organization faces uncertainties that are not accountable in existing approaches to design practices; and that absorbing this capacity can lead to creating innovative products from the architectural level to its meaning *per se.*

2.5.3. The Shifting Design Rules in Creating Digital Materials

2.5.3.1. From a single hierarchy to multiple hierarchies

Technology development and increasing complexities of new products have not only impacted on changing environments in social and technological development, but have also changed the meaning of design from creating functional and material objects (mostly aesthetics) to conceptualizing and

immaterial artefacts (Krippendorff, 2006; Krippendorff, 2011). The shifting design rules and principles also affect the logics of organizational approaches to managing design, as well as its logics (i.e., organization structure) (Yoo et al., 2010). It is summarized as changing design approaches towards a less hierarchical structure in product development processes, as well as its organization structure and logics.

The exemplar case of the shifting design trends in design rules and the organizational logic is 'digital product design' and its approaches to managing development. A wide range of smart devices, such as iPad, iPhone, Kindle etc., are evolved into artefacts that are able to be designed and reprogrammed with discourses by users and organizations through encoding analog information into huge amounts of digital format in unprompted, spontaneous, or fluid approaches at a product level (Yoo et al., 2010).

The major change of approaches to managing design in new product development has explicitly shifted the meaning of design by changing the rules of design in principle. Traditional product design principles and logic have been based on a reductionist approach. The rules of design in development processes have been discussed in a single fixed meaning of product boundary, and its single hierarchical and tightly coupled 'modular architecture' shaped pyramid, which responds to a certain targeted market and vertical technological needs (Clark, 1985; Yoo et al., 2010; Yoo, 2010; Henderson & Clark, 1990) (see also Section 2.4.2.1.). The meaning of design has thus paid much attention to separate aspects of the physical goods or services, such as design as styling and looks in traditional design principles (Karjalainen, 2003; Karjalainen & Snelders, 2010).

On the contrary, the shifted design rules in digital products are structured differently and they are composed of multiple design hierarchies across several layers of product: physical device layers, network, services and contents (Kallinikos, et al., 2013; Yoo, et al., 2010) (Table 2.7). The elements of digital design, therefore, embrace physical looks and functions (i.e., device layer) to certain immaterial assets in which human interaction is involved (i.e., service and contents layer); all of these are developed in loosely coupled multiple hierarchical **'**layered modular architecture'. This product architecture constitutes a 'digital platform' (discussed in Section 2.7). Consequently, a well-established *digital platform* can enable jointly built *digital ecosystems* with diverse organizations for a digital product as a whole in the digital ecosystem (Yoo et al., 2010; Eaton et al., 2011; Gawer, 2009). For instance, smartphones should be essentially composed of essential parts, such as an operating system, as well as service and contents via the product as a whole (Kenney & Pon., 2011). As a result, a well-established *digital platform* enables jointly built *digital ecosystems* with diverse organizations for producing novel digital components (e.g., applications and hardware) that constitute a digital product as a whole in the dynamic digital ecosystem (Yoo et al., 2010; Gawer, 2009; Eaton et al., 2011; Yoo et al., 2012). The competitive landscapes between design participants for digital product

platforms result in a digital product that is denoted as the *digital landscape* (Yoo et al., 2010; Yoo, 2010).

This changing of notions between the elements of product design helps all those goods, components and products to become data like software, and allows consideration of generative design practices, such as 'open design' (discussed in Section 2.4.4.), based on the open source models using the data that can be executed in the chain of digital manipulation across intangible (software) and tangible goods (hardware) within their own ecosystems (Raasch & Balka, 2009).

It all suggests that new digital product design as a whole is not only limited to physical looks or the engineering of its system, but requires holistic perspectives towards artefacts as a whole.

Dimensions of layered architecture product		Description	Examples
Device layer	Physical machinery	• Computer hardware	Apple's iPad Amazon's Kindle
	Logical	• Operating system: Provides control and maintenance of the physical machine and connects the physical machine to other layers	
Network layer	Logical transmission	• Dealing with network standards such as TCP/IP or peer to peer	
	Physical transport	• Such as cables, radio spectrum transmitters etc.,	
Service layer		• Dealing with application functionality • The service creates, manipulate, store and consume contents	Amazon application Google search engine Google maps
Contents layer		• Texts, sounds, images, and videos that stored and shared	Apple's iBook Kindle store Google maps

Table 2.7 The layered architecture of digital technology (Yoo et al., 2010)

2.5.3.2. The changing role of product and conflict emergence

The changing principle of design rule in digital product design leads to changing the roles of products and components. The roles between products and components become performed as the one ecosystem acting like one artefact as a whole across products, components and the infrastructure (Adomavicius et al., 2008; Yoo et al., 2010). The roles of products and components are becoming more articulated and refined as technology is developed. Traditionally, the roles of product and applications have been played to 'interact with a user' in the given context of use, built up from component technologies to perform a specific set of functions in the specific context of use, and the capability of products and applications are able to be expanded in conjunction with other products and applications by shaping their own infrastructure (Ulrich & Eppinger, 2012).

However, in the world of digital technology development, the roles of these elements are greatly expanded, intertwined and interchangeable. A component can be another product or application, or a subsystem of other technologies in an ecosystem when it can help or improve another end product's function or usability, for instance, microprocessors, RAM chips, hard disks etc., (Adomavicius et al., 2008). As such, smartphones are products that are composed of multiple layers that can be perceived differently depending on how a stakeholder involved in the design of the smartphone views the product: e.g., contents layer or service layer can be part of a smartphone, so those stakeholders involved in these parts of design can be said to be components of smartphone device manufactures (Kenney & Pon., 2011).

On the other hand, despite seemingly democratic and generative approaches to managing design in digitalization, digital product development has to be dealt with in both specialization and standardization due to its complexity (Chang, 2009; Gawer, 2009).

The inference from this is that there is necessarily increasing competition and pressure on the financial benefits between costs and profitability from components to products and services within the complex managerial contexts. It is caused by different parts of the value chain, i.e., components as commodities and development of new products and service as the goods, whereby different profitability is made at each level, called a 'smile curve' (Chang, 2009; Shin et al., 2012). Higher profitability is featured in the development of 'new' products and services and securing technical and cost efficiency with making commodities, but simple assembly shows lower profitability (see Figure 2.4).

In this context, digital product and service producers do not easily consider converting the roles of products or components into other levels, such as a platform (see Section 2.4.3), although the roles of components, products platforms (or infrastructure) can be defined by designers' and users' resolved needs for their generative aspects (Adomavicius et al., 2008).

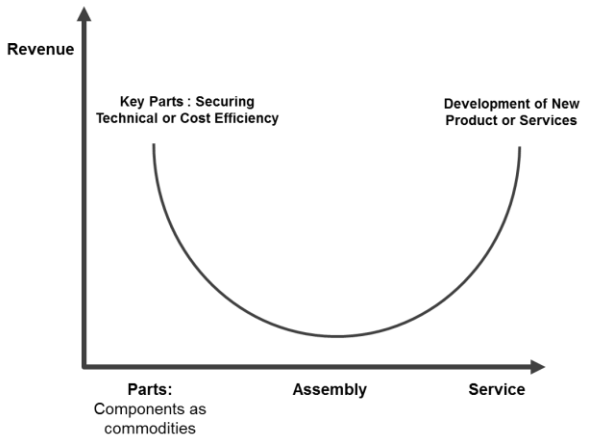


Figure 2.4 Smile Curve: value chain of the electronics industry and the responses (Chang, 2009: p.46)

2.5.3.3. Generativity and designing 'evolutionary' artefacts

In consideration of the shifting rules of design in digitalization, design practices in the environment can be characterized as generative or democratic practices due to designers, market, and user-driven practices led by information-rich environments, rather than one or two firm-led material practices (Krippendorff, 2011). This generative design practice is often found in digitalized products (i.e., digital products) characterized as experiential artefacts that are empowered by computing capability (Yoo, 2010; Yoo et al., 2010).

The newer design approaches to new digital product development employ prominently different design language, i.e. 'generativity'. The generative design approach, *generativity*, produces unprompted changes driven by large, varied, and uncoordinated audiences in creating fluid and open meaning. Because it is designed by multiple participants and the fluid, unprecedented and flexible characteristics of material and immaterial digital objects are co-created and crafted towards unforeseen values for new users (Yoo et al., 2010; Krippendorff, 2011). By doing so, generativity in design, therefore, embraces all relevant material as well as immaterial activities: such as simple product utility; service and project; and design with 'discourses', in collaboration with participation of community members to create artefacts (Krippendorff, 2006; Krippendorff, 2011). Thus, it rather underlines generating new meaning in the designing of a new product (or service) (Verganti, 2008; Yoo et al., 2010). In achieving generativity in design practices, a boundary of participants, groups and organizations that design a product is extended from *homogeneous* groups within an organization or a relevant industry, into *heterogeneous* communities beyond a fixed industry (Yoo et al., 2010).

In a similar sense, the shifting principles of design rules have been also specifically discussed in modularity theory: the degree of user participation (customer involvement) can affect the characteristics of new products. For example, 'assembly or use' vocabularies using 'existing knowledge' pay much attention to mass production within existing product design; whereas 'uniqueness' is probably derived from multiple and heterogeneous types of consumer involvement and it results in 'fabricated' or 'design' vocabularies embedded in the product. This is because uniqueness requires 'new knowledge' and 'new learning', which implies 'uncertainties' in meeting users' unique needs (Ulrich, 1991; Duray et al., 2000; Sanchez, 1996).

This concept of new approaches to design practices reaches a concept of '*designing*' as a verb distinguished from *'design'* as noun. The concept of *designing* is based on the conception of duality of structure (Giddens, 1979; Garud, et al., 2008) that embraces 'openness' and 'contexts' rather than 'texts'. It refers to the ongoing action to complete, mediate and structure outcomes in incompleteness, in response to continually changing, ill-defined problematic situations. For that reason, it represents digitalizing artefacts design, such as Wiki-family or LINUX software (Garud et al., 2008). It is stated as follows:

> It is useful to consider the dual meaning of the word 'design' within this context. As a verb, 'to design' refers to the process of developing a plan for a product, structure or component. As a noun, 'a design' is used to connote the outcome of the process. In traditional settings, these two meanings of design have been separated from one another. One would engage in a process of design (the verb) so as to emerge with a design (the noun) for a specific context. In contemporary settings, however, designs are more appropriately viewed as being simultaneously noun and verb, with every outcome marking the beginning of a new process. Put differently, designs are like dynamic jigsaw puzzles in which multiple actors assemble pieces within templates that change as a result of the actors' engagement (Garud et al., 2008: p. 352).

Combining the two notions, *generativity* and *designing*, corresponds with a dimension in the matrix about types of innovation, called radical innovation (Figure 2.1). In discussion of the terminological meaning of innovation, the technological development of an invention is combined with the market introduction of that invention to end-users through 'adoption' and 'diffusion' (Abernathy & Clark, 1985: see also Fig. 2.1). Figure 2.5 encapsulates the above relationship between innovation and design. The matrix exists on a continuum based on understanding of the innovation dimensions presented in Figure 2.1, and of the types of learning about product architectural knowledge in Figure 2.2.

- **Radical innovation** requires those elements found in holistic approaches: this is achieved by significant learning that contains high 'uncertainty', and so 'uniqueness' is derived from heterogeneous types of participants and the heterogeneous types of knowledge. Despite such high uncertainties placed in integrating those unique heterogeneous elements, this can result in discontinuity of the macro-level impacts on technical and market aspects if a new product is completed in this condition. Historically, very few products such as the steam engine and World Wide Web are included in this dimension (see also Figure 2.1). New products are those that are said to give rise to new meaning, and which have significant impact on subsequent artefacts aligned with those products.
- **Incremental innovation** is characterized by moderate learning achieved at a reductive level of understanding, such as parts of, or the inter-relationship between, those based on existing and moderate knowledge. It is thus accomplished in consideration of homogeneous and existing elements in carrying out design practices. Most new products and services generated at the organization level are included in this, which are all addressed within existing meaning of products and services: new product and service lines produced based on existing platforms are addressed within this dimension(see also Figure 2.1).

Thus, the following sections will discuss the detailed concerns of new product and service development processes as actual design practices and how they can manifest an organization and organizational design practices in order to examine differences of organizational cultures and organizational design outcomes.

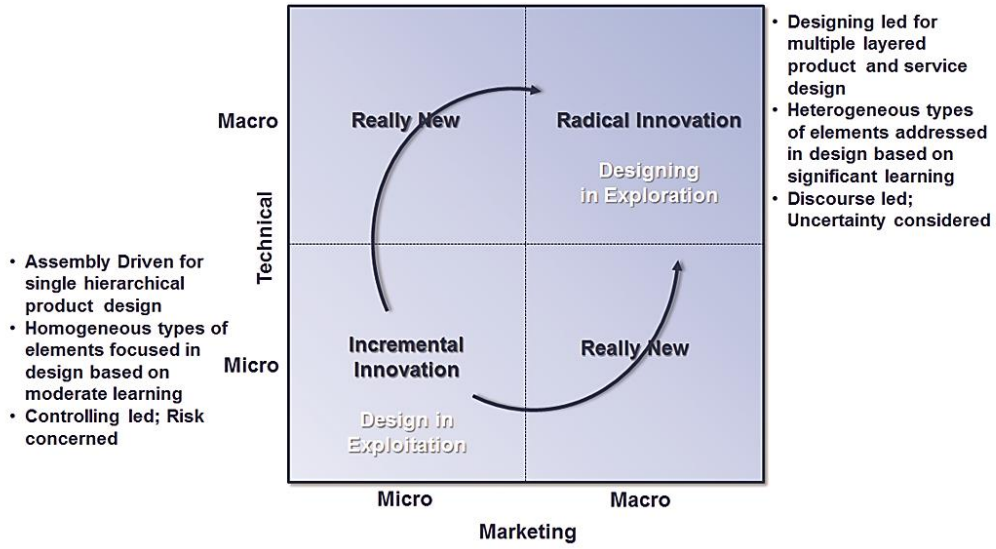


Figure 2.5 Summary about design and innovation in practices

2.5.4. New Product and Service Design in Exploitative Organizations

Norman's *Design of Everyday Things* (2013) proposed a principle called "Law of Product Development" (p. 237). He distinguished ideal theories on 'design' from 'a reality of design business', where market and technological competition overwhelmingly compels the development process. New product development (NPD) is simply the matter of a given schedule and allocation budget. For that reason, design processes and the project are simply denoted as politics in the management of those realities (Greenbaum & Kyng, 1991). This section aims to understand how the NPD process is significant as a vehicle for organizational design practices. It will explore types of NPD processes and understand elements of the process that organizations consider for seeking NPD opportunities.

2.5.4.1. Minimizing risks in new product and service design

Herbert Simon (1996) stressed that design criteria in design processes implicitly consider allocation resources due to the design of engineering structures of a product (i.e., cost minimization), so that design processes in actual design practices involve activities of conservation of scarce attention (i.e., management of the resources). In fact, the best product design contributes to making a profit, and so most organizations necessarily undertake improvements in productivity, quality and operations (Cooper et al., 2005). However, the NPD process *per se* is characterized by risk, uncertainty and anxiety, especially in terms of financial aspects and schedule (Baker, Murphy & Fisher, 1988; Hollins, 1991; Karjalainen, 2003; McMahon, 1967). It suggests that NPD processes exist in multiple dilemmatic situations between concerns about viable outputs and identifying new opportunities. It is summarized as follows:

- **NPD processes seeking viable opportunities**: New product development is defined as a process of organization that transforms technical ideas or maker's needs and opportunities into a new product that will be launched into the market (Bruce & Cooper, 2000). It contributes to the creation of good business for the company that can be used in the market with maximized production (Hein & Andreasen, 1987). In this sense, problem -solving and capitalizing on the opportunities for organizations, the financial attractiveness and market assessments or payback period etc., are the major concerns of developing new products. Also, the process is expected to express product design specifications: such as aesthetics; size and weight; operating conditions and environment factors; resource allocation and process needs; prospective market share and post-development marketing; and company policy, using statistical data and other tools (Pugh, 1991; Cooper et al., 2005). The data, however, often shapes a premature decision about the overall 'cost' and 'complexity' of the product (Cooper et al., 2005).

- **Creative NPD process:** On the contrary, new product development processes are referred to as the most creative processes. This is because creative ideas for new product design are raised and evolved in the product development process with several testing and detailing refinements in order to seek new opportunities for the company's goal (Ulrich & Eppinger, 2012; O.McMahon, 1967; Hein & Andreasen, 1987). As the initial creation for new product design, a wide set of alternative product concepts are followed by the subsequent narrowing of alternatives and specification. This is processed through information systems for delivering the development information, formulating specifications, concept development and design details along with the corporate objectives and strategic opportunities by reviewing available technologies, product platforms, and production systems. It is therefore regarded as part of the risk management system in the early stages (Ulrich & Eppinger, 2012).

The suggestion from this is that looking at the detailed mechanism of new product development can specify much:

- First, the term 'process' should be taken into account to clarify the product development process. A process is defined as a sequence of steps that transforms a set of inputs into a set of outputs (Ulrich & Eppinger, 2012). A process in organizations is thus regarded as a methodology that is developed to replace the old ways and to guide corporate activities year after year, i.e., constant and common proceedings of organizations (Berry, 1991). In dynamic and unstable business environments, a process is therefore characterized as the reflexive response to the environment, which enables an organization to remain effective and profitable through the changing conditions (Cooper et al., 2005). In this sense, every organization employs a 'process' and several different types of projects are

carried out using intellectual and organizational activities, rather than physical ones (Ulrich & Eppinger, 2012). This suggests that 'controlling' in organizations manages complexities (note Section 2.3.).

- For these reasons, new product development process is necessarily characterized as '*iterative'*. Looking at several different types of new product development process models (e.g. sequential, overlapping and stage-gate phase) (Cooper et al., 2005; Sanchez & Manhoney, 1996: see Fig. 2.6), these have been evolved into the more iterative and explorative ones that can cover such fuzzy NPD processes (i.e., from linear and sequential to funnel model). By doing so, it can create new and ideal products and market opportunities by utilizing trial and error methods of the organizations because organizations should cope with all constantly changing elements across all level of business, from higher levels (the organization, market, product, and production development) to lower levels (quality control, financial control, stocks, sales, advertising, analyzing competitors) and the various services of functions (Cooper et al., 2005; Hein & Andreasen, 1987).

- Lastly, the dilemmatic situations can occur within a process itself due to the explicitly perceivable controlling factors such as allocation resource and timeline management, which are addressed in exploitation of organizations. In general, most exploratory phases to identify new opportunities in the NPD process are seen in the pre-product development phase that determines if the project is approved and launched in the actual product development process (Ulrich & Eppinger, 2012). However, the amount of investment for idea generation is not perceivable at those pre-product development phases and the cumulative cash at this early phase, clearly, shows zero (Andrew & Sirkin, 2006). In this sense, organizations should determine how the results of the NPD process would be paid back in cash once a new product is launched because the cost incurred at the early phase can lead to a dramatic rise in the cost of manufacturing (Hollins, 1991). Furthermore, although the early phase of the NPD process is significant in creating 'new opportunities', such as own brand identity and design languages, the incubation process, or idea generation, should 'take time' (Karjalainen, 2003).

Furthermore, in the NPD process, opportunities that arise at the early phase are not likely to be newly-sensed needs and new discoveries, but rather a rough match between a need and a possible solution for its exploitation within an organizational logic. In other words, the opportunities come either from existing knowledge and solutions (certainty), or from new needs and solutions that we do not address (uncertainty), but the identification of opportunity in the NPD process is apparently challenged by typical organizational logics for exploitation (Ulrich & Eppinger, 2012). Based on this, the following section will discuss how NPD in itself can represent an organization as the representative project group.

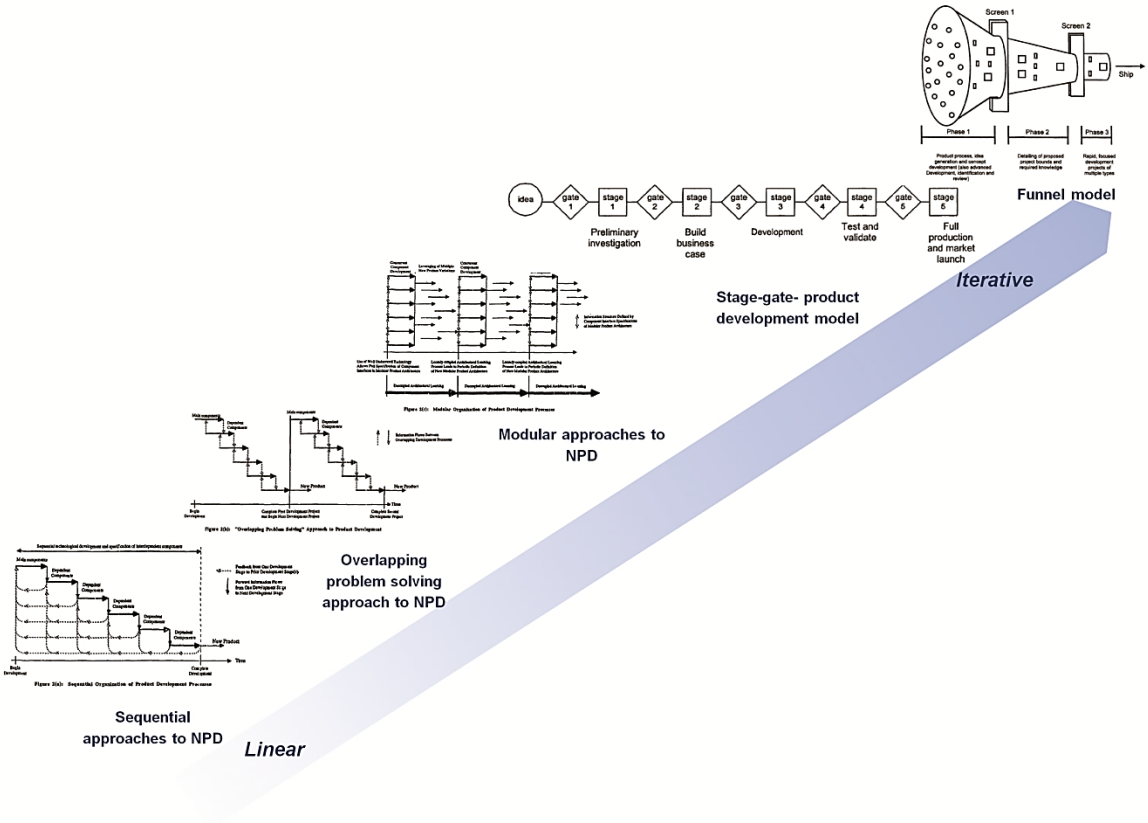


Figure 2.6 Product development processes (after Sanchez & Mahoney, 1996)

2.5.4.2. Project-based NPD group manifesting organization structures

This section explores to understand how the NPD process is carried out as a group, characterized as a 'project-based group' in an organization. The NPD involves multiple relevant design disciplinary groups and it represents organizational structures between external and internal design participants. This can be explained by employing Gestalt in organization designing with the focus on epistemic concepts of design (Yoo et al., 2006: p. 215).

- First, since the new product development process is simply referred to as the exemplary organization activity, in many ways the project group (NPD project group) can be said to represent the relevant organization and the structure (Yoo et al., 2006). In the process there is constant controlling and planning. As competitiveness and concerns about success and survival rate increase, organizations seek strategic significance from their new product development process (Cooper et al., 2005).
- Second, those strategic concerns not only take place in one group, but also across multiple disciplinary groups that are directly and indirectly involved in the NPD project. In fact, in terms of the several different types of new product models (Fig. 2.4.4.), all iterative processes are all closely

linked with different types of disciplines including marketing, design, advanced technology and research development activities, and they are aligned with subsets of groups of an organization (Ulrich & Eppinger, 2012; Cooper, 2001; Cooper & Kleinschmidt, 1986)

- Third, all groups in the NPD process are closely related to significant concerns on the realities of the design business such as time and resources (Sections. 2.4.3.2 and 2.4.4.1). In particular, most of those concerns are likely to arise from the viability issues of a project such as manufacturing. Since manufacturing should remain effective and profitable through the making of products, organizations usually have a number of development projects concurrently, from short-term profitable ones to those of a larger, long-term scale. Meanwhile, the organization should control and plan the project not only to pay attention to the short-term profits for existing customer requirements (Hein & Andreasen, 1987). In this sense, these NPD project groups are necessarily characterized as political groups because all those viable results of NPD are closely associated with budget, schedules, and technical capabilities (Baker et al., 1988; Ulrich & Eppinger, 2012).

On the basis of the understanding of NPD, the next section will discuss the traditional principles of the NPD process to understand the tangible mechanisms that make organizations seriously consider and explore how NPD affects new design approaches to digital design in the organization.

2.5.4.3. NPD principles as indicators of an organization's approaches to managing design

As noted in previous sections, projects in an organization are carried out with complex and political concerns about budget, schedules, and technical capabilities (Baker et al., 1988). However, the conventional concerns of actual organizational projects are reconsidered, especially in new digital product development, due to changing principles of digital product design (i.e., generativity and designing: see Section 2.4.3.3; see also Yoo et al., 2010). The traditional NPD principles that influence significant decision-making have, thus, been often discussed in relation to resources, time and product line variation (Person et al., 2008; Urban & Hauser, 1980). This has been addressed in many empirical studies of those traditional variables in the NPD process: resources input (cost); time to market and product line variation (Karjalainen, 2003; Person et al., 2008; Putsis Jr & Bayus, 2001; Ulrich & Pearson, 1998). The reasons why those are addressed in traditional NPD theories are summarized as follows:

- **Resources (cost)**

  Seeking opportunities to launch NPD projects starts with concerns over the realities of management and manufacturing in detail across the overall development process: e.g., product specification, operating conditions, resource allocation, financial attractiveness and

market assessments or payback period and company policy etc., (Pugh, 1991; Cooper et al., 2005). In terms of this, matters of resources suggest two aspects: (1) input for supportive technology; (2) costs for better opportunities for market leadership. A certain amount of cost represents the level of technology input in accomplishing new product design and encouragement of competitive entry for the long-term profitability of an organization (Urban & Hauser, 1980). In industrial design, cost is seen as a key feature to achieve product design: the quality of product design (the aesthetic and ergonomic characteristics) (Ulrich & Pearson, 1998). In doing so, an organization can consider the expansion of opportunities through product variation in the product portfolio with fewer resources for maximized profits (Person et al., 2008). For that reason, the data in NPD often shapes a premature decision, as concluding the overall 'cost' and 'complexity' of the product at an early development phase reduces sunken costs in the following phases (Cooper et al., 2005; Hollins & Hollins, 1991). Therefore, the amount of cost involved in the NPD process suggests not only yielding opportunities, but also concerns about the risks derived from spending costs.

- **Time**

  In relation to issues of resource, matters of time in the NPD process represent two aspects in organization: (1) time to respond to market; (2) time for ideation in the development process, showing contradictory relations. First, in a strategic sense, rapid response with better-qualified product design can enable organizations to meet market needs, so it yields positive sales outcomes (Pearson et al., 2008). On the other hand, sufficient time is necessary in the design process for adequate ideation for enough incubation time, which can create own brand identity and design language in the new product design (Karjalainen, 2003). However, the product development process is carried out in traditional principles of the product life cycle: introduction, growth, maturity, and decline (Ulrich & Eppinger, 2012). Therefore, a new product design should be launched or re-aligned before the decline phases to seek new opportunities (Urban & Hauser, 1980) with multiple organization capabilities, such as effective communication within internal organizations, simplified processes, and common platforms for modular approaches (Abegglen & Stalk, 1985). Therefore, despite the burden of increasing costs and the pressure of tight time scheduling, the organization should control 'time' to launch new products to create better competitive opportunities.

- **Product line variation**

  In order to maximize market opportunities, a new product is either designed or expanded by using either the existing knowledge and solutions, or new needs and solutions that have not been addressed (Ulrich & Eppinger, 2012). This is reflected in the product line's variation in the NPD process. Product line extension has been seen as having a positive effect on

increasing financial revenues based on sharing product platforms (Kekre & Srinivasan, 1990; Urban & Hauser, 1980) Thus, traditional decision-making for physical product variation has aimed at reinforcing clearer product identity based on the historical continuity of a product design (Monö, 1997). However, this product line extension also suggests incremental pressures from internal and external organizations because it yields increasing costs and supervision for preserving higher quality products across the product line in internal organizations (Abegglen & Stalk, 1985); at the same time the organization suffers from continuous external pressures to meet increasing consumer needs (Putsis Jr & Bayus., 2001).

However, a digital product, as a whole, is differently addressed by, and has different meanings for, each user. This is because such a product affords customer customization and personalization (Section 2.4.3.3). An end product, as a whole, is formed through the addition of content and services in each layer supported by the physical device, which are constructed by diverse participants and users beyond one internal organization's control, i.e., generativity and designing (Gawer, 2009; Yoo et al., 2010; See also Section 2.4.5).

2.5.4.4. The shifting design practices for designing

2.5.4.4.1. Dilemmas of individual design professionals in organizations

As noted earlier, shifting logic of design rules in digitized products, from single hierarchical manners to multiple layered architectures, has called for shifts in the logic of organizational structures, i.e., from the vertically integrated hierarchy to loosely coupled and decentralized structures. By doing so, organizations respond to unprompted changes across competitive digital landscapes in terms of technology and marketing (Yoo et al., 2010). The inference from this is summarized as the dilemmas between centralized organizations using conventional, tightly-coupled, linear and controlling organizational vocabulary and loosely coupled, decentralized, flexible and enabling ones (see also Krippendorff, 2011).

Returning to new digital product development and the design rules (Section 2.4.3.3.), means that as complexities (followed by the uncertainties) emerge from shifted design rules, roles of design professional members including designers, engineers, marketers and so on in organization are also shifted and organizations have to reconsider their roles to deal with their professions effectively. In particular, breakthrough digital design, such as Apple's iPod, is developed by a reflexive, insightful, and experienced individual design professional, rather than standardized, systemized, collective professionals (Saffer, 2009). In particular, such 'genius designs' rely on a few design experts' wisdom and experience with their best judgments about users as well as the product's design (Table 2.8).

However, there are deeply rooted concerns in digital design, which cannot be covered by individual design professionals. It is caused by the nature of digital design where heterogeneity aspects are overwhelmed (Section 2.4.3.3; see also Eaton et al., 2011; Yoo et al., 2010; Yoo, 2010). This can be found in different types of disciplines that are necessarily merged into one digital design domains, such as hardware vs. software, due to use of different system thinking and the approaches to design (Section 2.1.3). For instance, compared to hardware design, software design is underlined by continuously and readily changing problems in response to highly customizing demands that are spotted from different modules. So the attainment is achieved by loose-coupling modular *'action'* based on fundamental *'logic'*. This achievement can be made through loosely-coupled organizations (Sanchez & Mahoney, 1996).

This suggests that digital design is squarely situated in dilemmatic relations between individual professions and collective organizational approaches to managing design practices. In this sense, Cohen and Levinthal (1990) noticed a significance of cross-function interface in order for individual professionals to maximize their absorptive capacity into an organization as it can foster members' diverse capacities. These diversely accumulative capabilities can be absorbed into organizational capabilities.

Approach	Overview	Users	Designer
User-centred design	Focus on user needs and goals	The guides of design	Translator of user needs and goals
Activity-centred design	Focus on the tasks and activities that need to be accomplished	Performers of the activities	Creates tools for actions
Systems design	Focus on the components of a system	Set the goals of the system	Makes sure all the parts of the system and in place
Genius design	Skill and wisdom of designers used to make products	Source of validation	The source of inspiration

Table 2.8 Four approaches to design (Saffer, 2009)

2.5.4.4.2. Generative design practices in digital innovation

On the basis of the above, there is increasing interest in new approaches to design practices that can embrace 'designing' and 'generativities', such as applying digital technology and the principle of its openness, as open design or co-design. Open design has often been discussed in scholarly theories on design studies (co-design) and R&D management areas, which use the term 'open source software' (OSS), and its 'open source model' across intangible and tangible objects of development (Rasch et al., 2009; Sanders & Stappers, 2008).

Initially, in R&D management studies, the attention on open design is caught up not only in creating limited ranges of digital materials, such as the entire family of Wikis, but also considers the range of applications of the principles into: cultural goods; open science; development of educational tools and bioinformatics databases, using its own open source model led by co-developed, co-funding and freely-shared principles. In this sense, the successors to those scholars argue that the principle of open design can also be employed not only in open hardware, but also with other physical objects, by adapting the OSS model, as presenting a limited range of examples of industrial goods, such as bicycles to microchips; MP3 players to manufacturing equipment (Rasch et al., 2009). Likewise, in design studies the contexts (co-creation and collaboration) were also started with the co-creating process of the digital realm, such as Wikis (Wikipedia) **(Sanders & Stappers, 2008)**. This is rather focused on the design participants' behavioural and attitudinal aspects that can lead to any acts of collective creativity. However, open design can not always be applied to all designing domains. For instance, online dictionaries were not successful in the use of open source mechanism, although the families of Wikis primarily use the principle.

It all implies that the reality of open design is not necessarily said to be the best model for all generative designing process, as it needs to consider the depth and extent of uncertainties to be applied in a design domain, followed by the variables on organizational controlling issues.

2.5.5. Platform Strategy as Design Outcomes

This section contends that the platform strategy of an organization manifests all organizational approaches in managing its design practices and that this reflects whether the organization approaches its design practices from holistic perspectives.

As noted in Section 2.1.3**,** *a stable intermediate form* that can enable an internal structure to interact with its components in devising complex artefacts can help to evolve its complexities far quicker than ones that only interact within the components level, with little effort to understand all the complicated details of components in reductive manners (Simon, 1996). In this sense, a concept of platform can be denoted as *the stable intermediate form* as a design outcome of an organization**.**

To explain this, the notion of outcome of an organization is distinguished from output of an organization, whereby 'outcome' suggests things to be elaborated *as* output before generating 'output' (i.e., goods and services)(note Section 2.3.2.3; also Farjoun, 2010). In this sense, platform strategy is an outcome to be undertaken as new product strategy, so it implies the way that an organization views its platform and relevant design practices in either holistic or reductive perspectives.

Platform strategy aims to achieve governing technology evolution, product and system design and business relationships within the interdependent ecosystem for effective operation and design of complex products system; whereas a strategy on product is limited to a boundary of proprietary

product lines controlled by one company (Gawer & Cusumano, 2008; Baldwin & Woodard, 2009). Although the term platform is overwhelmingly discussed in literature on product development, technology and industrial economies are the root of platform and these come from engineering design to identify structural features of complex products or systems (Baldwin & Woodard, 2009). In this sense, taking the concept of approaches to structural features of complex artefacts, discussions of design output and outcomes of organizations can be discussed in this area: output suggests 'product' *per se* as final good and outcomes can be called all things regarding organizations' environmental issues surrounding complex artefacts generation process (note Section 2.3.).

2.5.5.1. Digital platform strategy: towards evolutionary design outcomes

Current digital products using medium level technology, such as consumer electronics, computers, software, mobiles phones and so on (note Table 2.6), are built based on certain product platforms; these are featured in a boundary called 'platform products' and 'quick-build products', which are aligned with certain technology roadmaps for effective deliverables based on setting platforms (Ulrich & Eppinger, 2012; Eaton et al., 2011; Yoo et al., 2010). Not only those complexity-based products, but also products that are composed of a set of sub-systems and interfaces, are included in platform-based products, such as automotives, consumer electronics, airplanes and industrial goods. This is because these products are developed based on a form of common structure and the platform strategy, as concerned with saving cost, efficient development process, scalable deliverables based on flexible product design, and mass customization for a variety of customers' needs (Gawer, 2009).

From a terminology perspective, 'platform' refers to a design, a concept, or an idea, which is served as a pattern or model to explain the concept of complex products and systems of production for engineering design (Baldwin & Woodard, 2009). In industrial design, product platform refers to 'the set of assets shared across a set of products' (Ulrich & Eppinger, 2012).

In this connection, the definition of a platform can be clarified with a typology of platforms. In consideration of the basic modular logic of product design shared complexity of hierarchical structures between organization structure and product system design (Yoo et al., 2010; Schilling, 2000) (Section 2.4.2.), definitions of platforms are broadly divided into two: internal (company or product) platforms and external (industry) platforms. The former is addressed within the range of one firm for their efficient derivative products, whereas the latter is discussed across internal and external (industry) platforms with complementary participants organizing a business (Gawer & Cusumano 2013; Gawer 2009: Table 2.9). Digital relevant products and services, such as Microsoft Windows operating system; Linux operating system; Apple's iPod and iPhone; the Internet search engine Google and social networking site Facebook; as well as financial services and high-technology products, such as genomic technologies, all take place in those industry (or external) platforms. In an ecosystem as a

whole, several heterogeneous firms function and plug-in together beyond concerns about proprietary interests, once their products and services are delivered (Gawer, 2009,pp 46-58). So in those platforms with complementary platforms and users, there are increasing benefits for both firms and users (Gawer & Cusumano, 2013).

Type of platform	Internal platform	Supply chain platforms	Industry platforms	Multi-sided market or platforms
Characteristics	**Internal**		**External**	
Context	**Within the firm**	**Within a supply chain**	**Industry ecosystems**	**Industries**
Number of participants	**One firm**	**Several firms within a supply chain**	**Several firms who don't necessarily buy or sell from each other, but whose products/ services must function together as part of a technological system**	**Several firms(or groups of firms) who transact with each other, through the intermediary of a double-sided (or multi-sided) market**
Platform objectives	• To increase the productive efficiency of the firm • To produce variety at lower costs • To achieve mass customization • To enhance flexibility in the design of new products	• To increase productive efficiency along the supply chain • To produce variety at lower costs • To achieve mass customization • To enhance flexibility in the design of new products	For the platform owner: • To stimulate and capture value from external, complementary innovation For complementors: • To benefit from the installed based of the platform, and from direct and indirect network effects complementary innovation • Interfaces around the platform allow plugging-in of and innovation of, complements	• To facilitate the transactions between different sides of the platform or market
Design rules	• **Re-use of modular components** • **Stability of system architecture**	• **Reuse of modular components** • **Stability of system architecture**	• **Interfaces around the platform from direct and indirect networks affects complementary innovation**	• **Not usually addressed in the economic literature**
End-use of the final product, service or technology	**End- Use is known in advance and defined by the firm**	**End-use is defined by the assembler/integrator of the supply chain End-use is known in advance**	**Variety of end-uses End- uses may not be known in advance**	**Not usually a variable of interest in economic literature**
Key questions asked in the literature	***How to reconcile low cost and variety within a firm?***	***How to reconcile low cost and variety within a supply chain?***	***How can a platform owner stimulate complementary innovation while taking advantage of it? How can incentives to create complementary innovation be embedded in the design of the platform?***	***How to price the access to the double-sided (or multi-sided) market for the distinct groups of users, to ensure their adoption of the market as an intermediary?***

Table 2.9 Distinctions of platform definitions by design contexts (adapted from Gawer, 2009; Gawer & Cusumano, 2013)

2.5.5.2. Considerations for digital platform strategy

Looking into platform distinctions there are a few considerations to be discussed in platform strategy. The major concerns about this can be summarized as dilemmatic situations between *open* and *controlling*. These have been discussed in the literature as follows:

- First, not every platform can satisfy conditions of platform, neither can product be platform in terms of sizable and expandable technology and business achievement (Gawer & Cusumano, 2008; Gawer, 2009). Adequate platform strategy should tackle technological and business problems for heterogeneous platform complements, when it interfaces with them. However, firms' approaches to an industry platform somehow contain certain proprietary issues such as buy-and-sell between platform complements. This causes sensitive challenges in designing the right product architectures and the interfaces and disclosing intellectual property when facilitating third parties (Gawer & Cusumano, 2008; Gawer, 2009).
- Second, organizations should control the evolutionary aspects of platforms (Table 2.9). First of all, for proprietary issues, it can cause sensitive issues involving external participants. This is because accessing sensitive internal organizational matters, such as confidential intellectual property related to significant technology, can result in severe damage to the company that allows access (Chesbrough, 2003). Accordingly, in terms of design rules, in principle, the relationship between components and product architecture in a platform should be governed by a set of stable constraints or design rules for interdependent and effective functions (Baldwin & Woodard, 2009).
- Last, for these reasons, platform leadership should be considered in industries, as to whether an organization can embrace the uncertainties of product technology, relationships between external complementors and internal organizations, and organizational culture in a holistic or reductionist manner (Cusumano & Gawer, 2002: p. 53). Since current digital product platforms are based on loosely assembled ecosystems between internal and external participants, it requires a whole industrial outlook from evolutionary perspectives covering industry ecosystems that can embrace heterogeneous types of products and industries. For that reason, platform leadership issues cause dilemmatic conflicts, whether the organization is going to be the antagonist or protagonist amongst the platform complementors. A platform firm's approach is either as a protagonist or an antagonist (Eaton et al., 2011) by embracing heterogeneous complements that form a digital platform across layered modular architecture (Yoo et al., 2010).

Taking those concerns, those industry (external) platforms should be embarked upon with compelling visions towards an unpredicted future, 'creating new human experiences with devised artefacts moving beyond one company's explicit financial benefits' (Gawer & Cusumano, 2008). This can be called holistic design approaches to managing 'designing' in actual organizations.

2.5.5.3. Different approaches in managing platform strategy

Platform strategy is regarded as a reflection of an organization. In that it can be called the design outcomes of all significant organizational mechanisms.

In fact, a product is designed and manifested by the modular logic of an organization due to organizational strategic approaches in design rules and organizational logics (Baldwin & Clark, 2000). Since design rules in product architecture aim to achieve the best function of the product's own interfaces, through shared complex hierarchical structures, (Yoo et al., 2010; Schilling, 2000), decisions regarding product platform development are necessarily made by considering the firm's significant technology capabilities and putting their efforts either into new, or derivatives of the, product design (Ulrich & Eppinger, 2012)(note Section 2.4.2.).

In this sense, a firm's strategic decision can be differently shown in platform strategy. Annabelle Gawer (2009) (see also Gawer & Cusumano, 2008) addressed two types of generic strategies on platforms: coring; and tipping.

Coring is greatly focused on holistic approaches such as '*how to establish a platform when none existed before?'* Its emphasis is primarily on creating a fundamental platform that has never existed before (i.e., technology, product or service), whereas tipping is reflected in *'how to win in platform competition?'* Thus, this is rather more focused on a set of activities or strategic elements regarding marketing, sales, pricing, and product development *per se* and so on. This is summarized in Table 2.10.

Concerns are raised from different approaches to managing platform strategy (i.e., design outcome of organization). This is a confusion in strategies between product and platform strategy. As noted, coring platform strategy is largely emphasized in holistic approaches as it is principally concerned with what has been never addressed before, which is essentially challenged in 'uncertainties' than predictable 'risks' (note Section 2.4.1.2). Since all organizations do not need to take advantage of a platform leader for their feasible profits, platform strategy is not necessarily considered for all organizations. Besides, the decision must be made in the very early phase, by considering all feasible incentives from the platform as related to all actual concerns on platform strategy (presented in Section 2.4.5.2); the specific decision on platform strategy is likely to be overlooked by organizations (Gawer, 2009; Gawer & Cusumano, 2008).

<table>
<tr><th>Strategic option</th><th>Technology/ design action to consider</th><th>Business actions to consider</th><th colspan="2">Platform strategies that new entrants do</th></tr>
<tr><td>Coring</td><td>• Solve an essential 'system' problem
• Facilitate external companies provision of 'add-ons'
• Keep intellectual property closed on the innards of your technology
• Maintain strong interdependences between platform and complements</td><td>• Solve an essential business problem for many industry players
• Create and preserve complementors' business incentives to contribute and innovate
• Protect your main source of revenue and profit
• Maintain high switching costs to competing platforms</td><td>Coring strategy
• Attack the system based competition with an 'industry platform'</td><td rowspan="2">Coring and Tipping strategy
• Articulate an alternative industry platform business model for those who were left out. Or opponents of, the original platform business model : Useful to build a coalition of competitors</td></tr>
<tr><td>Tipping</td><td>• Try to develop unique, compelling features that are hard to imitate and that attract users
• Tip across markets: absorb and bundle technical features from an adjacent market</td><td>• Provide more incentives for complementors than your competitors do
• Rally competitors to form a coalition
• Consider pricing or subsidy mechanisms that attract users to the platform</td><td>Tipping strategy
• Enter with a closed/proprietary system/device and then bring on complements: rather focused on 'product strategy'</td></tr>
</table>

Table 2.10 Approaches to managing platform strategy (adapted from Gawer, 2009)

2.5.6. Overview

This section aimed to understand the more detailed mechanisms in approaches to managing design for new products in organizations. In design rules and the logic of organizations in design practices the traditional principles has been changing and this is caused by digital innovation: digital design.

From the point of view, NPD can be regarded as the representative organizational design practice to understand the shift of organization of design practices. And platform strategy can be the major domain as it reflects such detailed organizational mechanism. That is assumed to be affected by organizational cultures in this study.

This section has explored approaches to managing design in organizations that are situated in managing uncertainties and risk. New product design can be thus said to be an outcome of organizations' formalization activities (i.e., information transfer) that follow planning and organization structure in certain hierarchical orders of product and organization.

However, design rules are currently shifting due to the digital technology development that is applied to digital products, and this leads to digital innovation. The representative design language is 'designing' with 'generativity' moving towards 'evolutionary' design practices. That logic of organizational approaches to managing design requires a shift from single hierarchical manners to loosely-coupled multiple hierarchical manners.

In the meantime, it is important to note the design mechanism factors that cause 'perceptual conflicts' are hardly neglected, such as time, resources, and product line variation issues. Organizations aim to reduce those elements considerably as considered about exploitation. Organizations' platform strategies represent all those actions related to design practices for new digital products. Therefore, we defined platform strategy in digital design as the representative design outcomes of an organization (or organizations). By looking at the outcomes containing systematic and organizational mechanism, this study contended that it can be identified how implicit organizational cultures affect not only new product development but also, explicitly, the design outcomes.

2.6. Setting the Theoretical Research Framework

To guide this study with a better understanding of the relationship between organizational cultures and design in digitalization, this study developed a theoretical framework, entitled the map of enacted organizational cultures in design practices. This is the part of following case study approach (Yin, 2009: to be discussed further in Chapter 3). The framework is developed based on the foregoing discussions of the literature on organizational cultures, design and innovation studies in the areas of new product development and R&D management, and that of scholars such as Hofstede (2010), Schein (2010), Scott (1998), Gawer (2008), Adler and Borys (1996), Baldwin and Clark (2000), Ulrich (2011) and Simon (1996). This will characterise the relationship between organizational cultures (Section 2.3) and complex organizations (Section 2.4) in creating digital new product and service (Section 2.5). The label, 'enacted organizational cultures' derives its name from considering the enactment of organizations (environment relations and human enactment in carrying out organizational practices, i.e., design practices) as this study is greatly focused on actual human decision-making (subjective and tacit) and such interaction towards design outputs in organizational approaches to managing design (see also the Section 2.4.2.3). The framework is composed of the following four dimensions constituting the map: (1) information system; (2) attention structure to new product and service development (3) development of digital platform strategy, and (4) enacted organizational cultures.

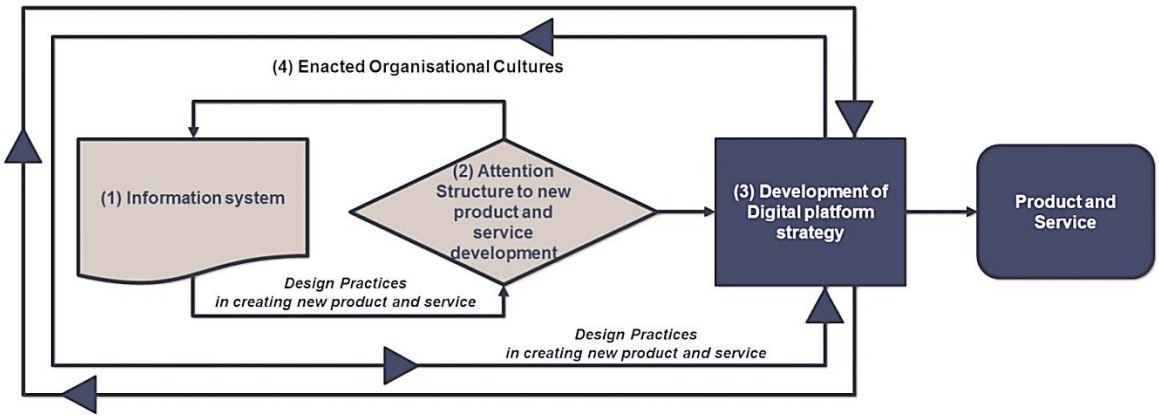


Figure 2.7 The theoretical research framework: the map of enacted organizational cultures in design practices

(1) **Information system (representative IT technology tools):** this represents organizations' formalization activities related to information transfer for visibly ensuring all processes in complex conditions of product and organization systems (discussed in Sections 2.4 and 2.5). The dimension is developed as related to 'cognitive organizational information systems' in an organizational structure and its domain in a process of structuring its attention to product development (Sanchez & Mahoney, 1996). So the cognitive information transfer form can be viewed as bureaucratic 'formalization' tools that are used for ensuring precise information transfer to reduce organizational risks during organizational material practices (Adler & Borys, 1996; Hofstede et al., 2010). Corporate IT infrastructures can be called representative formalization tools employed by modern organizations to transfer and leverage members' knowledge as well as fostering collaborative works in design and NPD practices (Yoo, et al., 2010; Akgun, et al., 2006; Boland, et al., 2007).

(2) **Attention to structure in new product and service development**: This dimension indicates enacted organizational attention structure and the environment in new digital product and service development process, considering the exploitation of organizations in creating new product and service (discussed in Section 2.4 and 2.5; see also Section 2.5.2). Since any projects in an organization are situated in complex and political concerns about budgets, schedules and technical ability, so attention to structure on an actual NPD also considers the risk or uncertainty that organizations face leading to explicit considerations, i.e., exploitation (e.g. concerns on financial situation and timeframe) (Hollins & Hollins, 1991), as well as product line variation (Hollins & Hollins, 1991; Karjalainen & Snelders, 2010).

(3) **Development of digital platform strategy:** As discussed in Section 2.5, this dimension comes from the assumption that product platform (digital platform strategy) is a reflection of organizational capabilities and the contexts (approaches to managing design) because product platform suggests organizational design outcomes that result from enacted organizational environments, before producing 'output' such as complete goods or services. The detailed concepts between outcomes and outputs are specifically discussed in the cycle of interdependence organization and environment in Section 2.4.2.3.
With this understanding, this study takes the notion that in order to account for organizational outcomes as the initiative of design outputs of organizations, platform is defined as the collective assets of organizational capabilities on their design practices leading to final design outputs, i.e., product and services (discussed in Section 2.5.5.1). This is based on the assumption that all significant ideas on the development of platform strategy in an organization can represent all significant decision-making of an organization with their organizational capability for new product design or its derivatives (Ulrich & Eppinger, 2012). Especially in digital technology-embedded product design and development, the term 'platform' even refers to 'design' or 'designing' itself as an embodiment of a whole organizational artefact in its own right (Baldwin & Woodard, 2009; Gawer & Cusumano, 2008). This is because it can represent how an organization approaches the 'design' of digital technology-embedded product and services either in holistic or in reductive approaches.

(4) **Enacted organizational cultures:** this dimension suggests the major aim of this study - how approaches to managing design differ nationally in examination of large organizational cultures. This is labelled by considering human enactment in discussions of organizational cultures and of design practices (note Section 2.4.2.3) and so it covers the entire enactment mechanism of organizational cultures in design practices. This is based on the understanding of the relationship between design management and organizational cultures, which were discussed broadly in Sections 2.2 and 2.3. This dimension therefore represents how enacted organizational cultures can be influential in carrying out actual design practices, i.e., new digital product and service design.
Since the logic of organizations has been addressed in the relationship between hierarchical structures of organizations and its material practices (Hofstede et al., 2010; Mintzberg, 1983), it is presumed that new digital product development strategy as an organization's outcome can be associated with those organizational attitudes that arise from different hierarchical structures of organizations and the inherent organizational cultures (Yoo, et al., 2006; Zammuto & O'Connor, 1992). This could be greatly differentiated in the distinctive

organizational cultures in the East and the West, as considered in prior studies on NPD (e.g., Lee et al., 2000; Song and Parry, 1997).

Each dimension contains a key agenda as a specific guide for this study and the entire framework is, therefore, to be developed and elaborated by scrutinizing how organizational cultures in the East and the West are interrelated with design practices in the following empirical study phases.

2.7. Chapter Summary

This chapter has presented a detailed literature review to provide a basic understanding of the relations between design, organization and organizational culture studies from cross-cultural perspectives in explanation of design practices in the landscapes of digital innovation.

The theoretical discussions addressed the areas of complex systems and complexity that imply hierarchical relationships, which are commonly underlined in the theories on product design, organization and organizational cultures. Before undertaking empirical studies, understanding of these basic concepts clarifies abstractions of the epistemological relations between organization and design studies for design research. This can help guide this research to achieve the research aims and objectives addressed in Chapter 1.

Based on this understanding, Section 2.5 presented the theoretical framework that can investigate how organizational cultures are enacted in design practices, digital new product and service design from cross-cultural perspectives, by encapsulating all those theoretical respects. This will assist in answering the research questions and lead to the development of a more rigorous theory along with the following empirical studies.

3.Research methodology

3.0 Introduction

For the best rigorously designed research, this chapter discusses how to approach the given research aims and questions (CH.1) with logical proven steps, by exploring the details of research design strategy, research methodology setting, data collection, and analysis.

The emphasis of the discussion will be focused specifically on the research context that involves multiple research domains including design, organization cultures and international organization studies from cross-cultural perspectives with regards to details of the research design fitting a consensual epistemological position between them. Research methodology and data analysis strategy will be set in alignment with the epistemological position for this study. The contents include:

- Considerations for research design (section 3.1.)
- Philosophical positioning of the research (section 3.2)
- Setting research methodology: case study (section 3.3)
- Application of Research Design (section 3.4)
- Data analysis (section 3.5)

3.1. Considerations for Research Design

3.1.1. Generic understanding of research design

When establishing the research aim and answering the given research question, Kumar (2005) noted that a general research journey is generally concerned with two important points.

- **What would be discovered when setting research questions?**
- **How to discover the answers to the questions?**

Finding answers to research questions starts with adequately designed research containing an adequate methodology as considered by certain structured steps (Kumar, 2005; Figure 3.1). That logical sequence of research design is important in order to resolve issues of implicit and tacit elements that exist in any type of empirical research. A research design is therefore a logical plan for getting from an initial set of questions to be answered, to a set of conclusions (i.e. answers) about the given questions (Yin, 2002). This is also inferred in the guidance for collecting data, analysis, interpretation and drawing inferences and the causal relations between variables; it is a blue print that deals with a map of research questions, data collection and analysis. Based on this, the following sections will address the details of research design and strategy for this thesis.

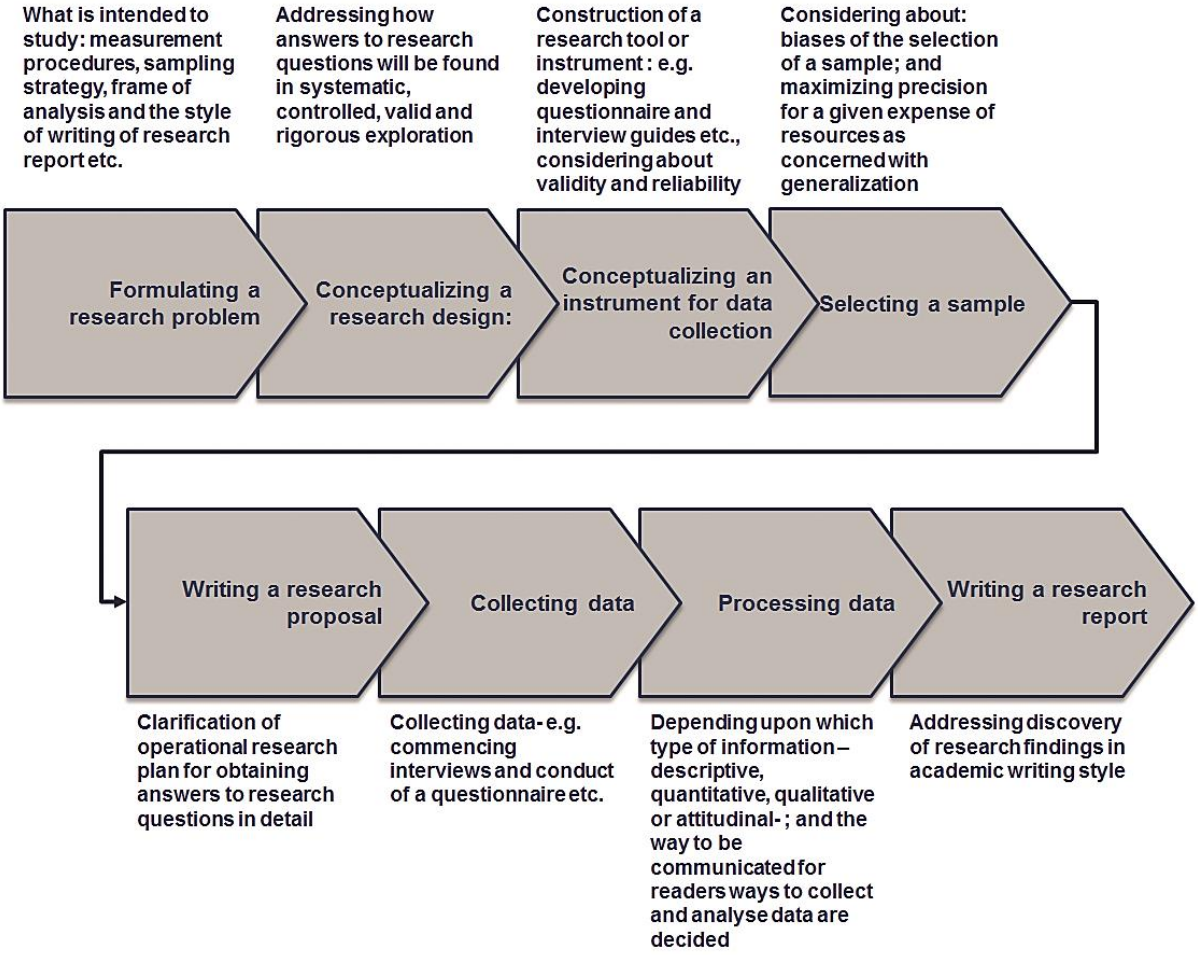


Figure 3.1 Research Process **(Kumar, 2005)**

3.1.2. Research Dimensions

Before we conduct this design research involving several research domains, it is important to identify and understand the process of conducting research and the use of the results of the research. This decision can lead a researcher to use a specific data collection technique in a certain way in the research design. In consideration of this research aim and domains, it is posited in applied social research that is aimed to 'explore' and to 'create' new pictures regarding a relationship between organizational cultures and design practices.

Each research project has fundamentally different purposes for the specific audiences who will see the study. Neuman (2012) presented the types of use of research and categories of the purposes of a study in social science. Firstly, the findings of social science research are used in broadly two key areas: **Pure basic and applied social research** (also Easterby-Smith et al., 2012).

- **Pure basic research**: aims to present knowledge and fundamental understanding about the social world, focusing on developing, testing, and supporting theories to deliver fundamental scientific ideas and ways of thinking to academic areas.
- **Applied social research:** advances specific concerns about particular problems. The purpose is to offer practical solutions for problematic real life events that happen in organizations, social movements and so on. This does not necessarily require a long term general understanding of the world, yet it is aimed to present specific solutions for practical problems with significant considerations about the generalisation of the findings to be applied to a specific question.

The debates on those two types of research have been, however, controversial especially in practice-based organization and management studies that emphasize the performance of private and public corporations. Because pure academic theory and the research cannot fully cover eclectic practical areas of those workplaces-e.g. the political concerns of researchers, multiple units and levels of analysis to conceptualize such complicated organizational events- those concerns are never divorced from the given research topic (Easterby-Smith et al., 2012; Langley, 1999).

In this connection, research must therefore clarify its purpose as determining the purpose of research can result in clarifying a way to approach a research aim by determining the basic logic of a research frame, to explore, to describe, or to explain about a certain topic. For this, three types of research purposes should be considered prior to setting the research design: exploratory, descriptive, and explanatory (Neuman, 2012; summarised table 3.1).

This research therefore considers about such complex human enactment in design practices in organizations, which is not easily replicated and tested under universal questions. To view problematic situations and explore the contexts are the main purpose for this research. With a basic understanding of those, the next section will discuss a connection between theory and research to conceptualise this research design.

Exploratory	Descriptive	Explanatory
•**Become familiar with the basic facts, setting, and concerns** •**Create a general mental picture of conditions** •**Formulate and focus questions for future research** •**Generate new ideas, conjectures, or hypotheses** •**Determine the feasibility of conducting research** •**Develop techniques for measuring and locating future data**	•Provide a detailed, highly accurate picture •Locate new data that contradicts past data •Create a set of categories or classify types •Clarify a sequence of steps or stages •Document a causal process or mechanism •Report on the background or context of a situation	•Test a theory's predictions or principles •Elaborate and enrich a theory's explanation •Extend a theory to new issues or topics •Support or refute an explanation or prediction •Link issues or topics with a general principle •Determine which of several explanations is best

Table 3.1 Types of research by purpose

3.1.3. Distinction of Theory and Research

Prior to conducting research, identifying the research purpose is associated with the term 'theory'. The issue is whether the research aims to develop a theory, to test or generate a new theory for future research (Corbin & Strauss, 2008; Neuman, 2012). The term theory implies to some extent the meaning of regularities that can explain the outcomes observed and a method of approaching a theory with a certain research technique determines whether to build or to test a theory in the research (Bryman & Bell, 2011). Thus, a major aspect of research is to characterize the nature of the link between theory and research and this is critical, especially in social science areas like natural science (Bryman & Bell, 2011; Neuman, 2011). Most topics in relevant social science research are characterized by a higher level of abstraction, which is not easily implemented into those theoretical perspectives due to complex humanity issues (Bryman & Bell, 2011; Corbin & Strauss, 2008).

In this sense, this study takes into account its research domains, which encompass multiple research domains regarding a human being's relevant material actions: design, organizational cultures, and international studies. It also leads us to consider the research audiences who will use the research findings. This thesis takes into account and understands the different meanings of theory. For instance, social science theory is referred to as an explanation of observed regularities to explain a certain social phenomenon (Bryman & Bell, 2011), and so it helps to clarify thinking, extends understanding, deepens discussion, and enriches analysis about the eclectic social world around us by providing clear explanations of abstract ideas about a given issue (Neuman, 2011).

However, all theories do not necessarily constitute a theoretical perspective, and sometimes it is featured in a higher level of abstraction in relation to research findings only (Neuman, 2012; Bryman & Bell, 2011). Bryman and Bell (2011) stress that there are broadly two types of theories: **grand**

theories that operate at a more abstract and general level, yet that are used in a limited range of social research due to its abstract nature; and **theories of the middle range** that are characterized as intermediate to general theories that are likely to focus on empirical enquiry. In similar ways, Neuman (2012) classifies a specific range of theories with three points according to the required empirical inquiries: **Empirical generalisation, Middle-Range Theory, and Theoretical framework.**

- **Empirical generalization** is addressed in the lowest level of an abstract theoretical statement within a narrow range, and so the empirical generalization is built through a few simple and concrete concepts, so that it is rather easy to test and observe. For instance, *"more men than women choose engineering as a college major."* which is only discussed in a relationship between gender and choice of college major.
- **Middle-range theory** is discussed in more abstract way than the former one. This is focused on a specific substantive topic area and so it often needs multiple empirical generalizations and building a theoretical explanation by being placed between grand theories and empirical findings (Bryman & Bell, 2011; Neuman, 2012). So, the research topic often represents trials to understand and explain a limited aspect of social life such as organization studies (Bryman & Bell, 2011).
- Lastly, **theoretical framework** is placed at the most abstract level amongst them. It is also named a paradigm or theoretical system. It provides collections of assumptions, concepts and forms of explanations in a shared scope of research from the micro-level of social phenomena to the macro. Within the framework, the research tests parts of an abstract theory in a research topic and so the framework is necessarily involved in multiple relevant substantive areas of a research topic.

However, it is needed to be aware that the distinctions amongst the types of theories cannot be clearly explained with a certain boundary, because if an attempt is made to clarify what a theory is for research it can be prone to being dismissive of research where there are no clear connections with either grand theory or middle range theory. The term theory is often employed when using a certain collection of literature that informs a generation of research questions and influences research focus which is a little remote from the actual complexity of the social world, such as organizational issues (Bryman & Bell, 2011). It can become **'naïve empiricism'**. In other words, theory should be considered only as a guide for the collection and analysis of data to answer research questions.

On this basis, the next section will discuss the direction of theorizing to logically connect abstract ideas to empirical ideas and test them.

3.1.4. Direction of Theorizing: Deductive, Inductive and Abductive

When considering the design of the research paradigm and its epistemological stance (to be discussed in section 3.2), abductive reasoning can provide a compromise on the issues that lie in the theorizing of this study. Theory is built and tested by bringing together abstract ideas and theory, and the abstraction becomes logically connected once empirical evidence is brought and tested with the data. By doing so, it is generalized towards the abstract ideas (Neuman, 2012). There are two prevailing approaches to reasoning as a feature of research design: **deductive** and **inductive**. However, this thesis also introduces the other reasoning approach for this 'design research': **abductive**, alternatively, with understandings of those two prevailing research approaches (Gibbs, 2007; Neuman, 2012; Bryman & Bell, 2011; Kovács & Spens, 2005: Table 3.2):

- **Deduction** is commonly addressed in discussions about the relationship between theory and research. An existing theory examined by a researcher is tested based on hypotheses – the hypothesis is deduced by being confirmed or rejected with research findings (Bryman & Bell, 2011). In other words, the research starts with a theory or an abstract relationship between concepts and it moves towards concrete empirical evidence through testing the abstract against hard data (Neuman, 2012). The logical process to reach a conclusion begins with scanning theory (e.g. literature review), and then presents a form of hypothesis and propositions in a certain setting of empirical research (Kovács & Spens, 2005). This generates conclusions based on the corroboration or falsification of its 'self-generated hypothesis and propositions'. So the process is simplified as **from 'rule' (the knowledge of a general frame or definite ligatures) to 'case' to 'result'.**

- **Induction** begins with detailed observation and it moves towards abstract generalization. A topic or vague concepts are firstly addressed and then observed (sometimes even without the knowledge of a general frame or literature) and examined with the evidence for developing and refining the concepts to create empirical generalisation, and find preliminary theoretical relationships (Neuman, 2012; Kovács & Spens, 2005). In other words, theory is the outcome of research, and observations about the world are the step that leads to emerging propositions and the generalization by shaping a theoretical framework (Bryman & Bell, 2011; Kovács & Spens, 2005). Within this context, approaches to induction in research is thus called **grounded theory** as it is built from the ground up based on a close examination of the data through iteration (Neuman, 2012; Bryman & Bell, 2011). The pattern is thus simplified as **case-result-rule** (Kovács & Spens, 2005).

- Unlike deduction and induction, **abduction** is somehow detached from theoretical concerns in the beginning and the end. It follows neither pure deduction nor pure induction. Yet the approaches to reasoning stress systemizing creativity or intuition to develop new knowledge (Kovács & Spens, 2005). As addressed above, in the approaches to reasoning, both induction and deduction are delimited within a boundary of known constructs; whereas abduction is aimed to create new knowledge with intangible, incomplete and uncertain knowledge to support 'the guessing process' (C.-Y.Lu & Liu, 2012). Thus, this is a type of logical inference that arrives at a hypothesis to explain a given observation or to a desired consequence with a focus of unexpected observation that calls for an explanation of the abnormality (Kovács & Spens, 2005; C.-Y.Lu & Liu, 2012). The approach is simply summarized as, **from rule to result to case** (Kovács & Spens, 2005). It does not necessarily draw a logically complete conclusion, but its emphasis is on correct anticipated rules and gives new insight (or supposition) or suggests general rules about the event or phenomenon. Thus, the empirical observation phase in an abductive reasoning process is called **theory matching** or **systematic combining**, and the data collected leads to **theory building,** rather than theory saturation (induction) or testing a theory (deduction).

Abduction has been, in this sense, applied to varyingly different disciplines that have developed their own approaches to further new knowledge, from learning, logic, neural networks, and artificial science in computer science to design studies (Kovács & Spens, 2005; C.-Y.Lu & Liu, 2012).

The abductive reasoning process is underlined for this research design approach. As a reasoning frame for design research, it can take advantage of using both deduction that is used for establishing the logical foundation of design analysis (e.g. deriving the design specification and stimulating design performance) and induction used as the logical foundation of design evaluation (e.g. to evaluate if a design concept is satisfying enough). Those reasoning processes are formed as the iterative loop with abduction that generates a new hypothesis (i.e. **theory building or suggestion**) (L.C.Cheng, 1994).

This thesis takes this logic of reasoning. As a conceptualizing and building process of building a theory for this study, it should be concerned with the research domains of this study which contain multiple research traditions and the issues of studying human enactment in those research domains (i.e. design, organizational cultures studies).

Inductive	Deductive	Abductive
• The generation and justification of a general explanation based on the accumulation of lots of particular, but similar, circumstances. • Thus, through repeated, particular observations the logical explanation of analysis of a study is made • Mostly qualitative based research uses this for generating new theory	• Particular situation is explained by deduction from a general statement about the circumstances • To do this, quantitative research employs this • A set of hypothesis is deduced and tested for accepting or rejecting the hypothesis	**• This is related to synthesis** **• The result of abductive reasoning is a hypothesis** **• It belongs to the synthetic reasoning that can extend and add new knowledge** **• It doesn't thus guarantee a uniquely true answer; multiple possibilities can be driven** **• It involves both hypothesis generation and hypothesis evaluation**
Observation/findings → theory (0)existing theoretical knowledge from prior research → (1) real – life observations → (2) (Final) theoretical conclusions (framework)	Theory → Observation/findings (1)Theoretical framework (from prior literature) → (2) theoretical conclusions(hypotheses H/propositions P reached through logic) → (3) testing of conclusions; (3) final conclusions (corroborating/abandoning theory); accepting/ discarding H/P	**A real life observation → theory matching/theory suggestion** **Prior theoretical knowledge → (1) deviating real-life observations → (2) theory matching →(3) theory suggestion(Final conclusions: Hypothesis/proposition) →(4) application of conclusions**

Table 3.2 Inductive, deductive and abductive approaches **(Gibbs, 2007; Kovács & Spens, 2005)**

3.1.5. Ontological and Epistemological Considerations

Before establishing a research methodology it is important that a decision is made on positioning an adequate philosophical stance for coherent ways of thinking promoted by influential proponents derived from the relevant philosophical debates (Easterby-Smith et al., 2012). In other words, establishing one's own philosophical stance significantly affects subsequent research design processes because it influences subsequent research questions, methodology, methods and data analysis as related to the following questions (Creswell, 2003):

- **What epistemology informs the research (e.g. objectivism, subjectivism, etc.)?**
- **What theoretical perspective lies behind the methodology in questions (e.g. positivism and post-positivism, etc.)?**
- **What methodology governs our choice and use of methods?**
- **What methods do we propose to use?**

All the above questions begin with the most central debates on philosophical concerns: ontology and epistemology. Questions on ontology and epistemology are central in social science. Ontology is related to the nature of reality and existence and it is about social entities. Epistemology is regarded as the best way of approaching the nature of the world (Easterby-Smith et al., 2012; Bryman & Bell, 2011).

However, although the debates on those philosophical stances are significant in research design, there is still confusion amongst researchers about distinguishing the terms ontology and epistemology, and the debates are placed in different ways in terms of the use of language. Corbin and Strauss (2008, pp5 -8) view ontology as assumptions about the world to present an adequate methodology; Easterby-Smith (2012) and Bryman (2011) discuss the set of assumptions to approach research by following methodology and methods in epistemological issues.

As noted, Cresswell's (2003) usage of terms in the discussion of epistemology above (e.g. objectivism and subjectivism used in epistemology), and Easterby-Smith (2012) stresses the confusion amongst researchers in the use of those terms. He attempted to clarify the distinction between ontology and epistemology by providing each with a detailed classification and the features: realism vs. relativism in ontology; positivism vs. social constructionism in epistemology. The definitions of ontology and epistemology are summarised in detail in table 3.3. This study uses the details classified by Easterby-Smith (2012) for consistency of use of those terms and to reduce confusion. Based on a basic understanding of the terms, this chapter will further discuss and justify how those ontological and epistemological issues are employed in this study for compromising multiple research traditions in section 3.2. Before that, the next sections will discuss how those ontological and epistemological orientations are addressed differently in terms of research strategy.

Ontology	Realism	Internal Realism	Relativism	Nominalism
Truth	**Single truth**	**Truth exists, but is obscure**	**There are many truths**	**There is no truth**
Facts	**Facts exist and can be revealed**	**Facts are concrete, but cannot be accessed directly**	**Facts depend on the viewpoint of the observer**	**Facts are all human creations**
Epistemology	**Positivism :** The social world exists externally and that its properties should be measured through objective methods, rather than being inferred subjectively through sensation, reflection or intuition		**Constructionism :** The new paradigm in reaction to the application of positivism for a view that reality is not objective and exterior, but is socially constructed and given meaning by people	
The Observer	Must be independent		Is part of what is being observed	
Human Interest	Should be irrelevant		Are the main drivers of science	
Explanations	Must demonstrate causality		Aim to increase general understanding of the situation	
Research progresses through	Hypothesis and deductions		Gathering rich data from which ideas are induced	
Concepts	Need to be defined so that they can be measured		Should incorporate stakeholder perspectives	
Facts of analysis	Should be reduced to simplest terms		May include the complexity of whole situations	
Generalization through	Statistical probability		Theoretical abstraction	
Sampling requires	Large numbers selected randomly		Small numbers of cases chosen for specific reasons	

Table 3.3 Summary of philosophical debates: ontology and epistemology (Easterby-Smith et al., 2012)

3.1.6. Research Strategy: Quantitative and Qualitative

With an understanding of epistemological and ontological issues it is important to consider and distinguish the different types of approaches to establishing research methodology. Distinguishing between qualitative and quantitative approaches is included because each of these has a different epistemological and ontological foundation. The differing approaches result in different types of data collection and of approaches to data analysis as follows (Bryman & Bell, 2011; Neuman, 2012; Neuman, 2011):

- **Quantitative research** emphasises quantification in the collection and analysis of data, so that its approach is rather characterized as a **linear research** following fixed steps (Bryman & Bell, 2011; Neuman, 2012; Neuman, 2011).
    - It is therefore based on a deductive approach concerned with testing theories in norms of the natural scientific model (i.e. realism and positivism).
    - It views social reality as an external **objective reality**.
    - The data used are mostly **hard data** in the form of **numbers for testing theories.**

- **Qualitative research** is rather characterized as a nonlinear research path that moves upward and indirectly in spiral processing, which rather emphasises words (Bryman & Bell, 2011; Neuman, 2012; Neuman, 2011).
    - It is focused on an inductive approach that is concerned with the generation of theories. It therefore relies on interpretative and critical social science (i.e. relativism and constructionism) by focusing on the **languages** of **cases and contexts**.
    - Its emphasis is on the social world, reality and on-going shifting and emergent issues that are hardly generalized by positivism and natural scientific models.
    - The data is therefore collected from **soft targets** such as forms of **impressions, words, sentences, photos, symbols** and so forth with a range of qualitative methods including interviews and observation for developing a new theory or hypothesis.

The understanding of these two approaches and the links with philosophical orientation are significant, as this study is situated in multiple research domains. (This will be further discussed in section 3.2). The next section will discuss how to approach the rigours of research: reliability, validity and generalizability.

3.1.7. Criteria in Research Design: Reliability and Validity

Prior to setting one's own research design, considerations about reliability and validity are central in any research in association with generalizability issues, since different ontology and epistemology

positions and the different research approaches, qualitative and quantitative, have different viewpoints. The technical terms, reliability and validity, are connected with measurement issues to constructs in research such as measuring particular variables and data collection techniques for the measures (Oppenheim, 1992). Both concepts are significant criteria for assessing the quality of research (Bryman & Bell, 2011; Neuman, 2011; Oppenheim, 1992). The concepts are however distinguished as follows:

- **Reliability** refers to dependability or consistency, or the purity and consistency of a measure. It is concerned with the repeatability of the results of a research study. In other words, research outcomes can be repeated and stable once the research is duplicated under identical and similar conditions, rather than erratic or inconsistent (Bryman & Bell, 2011; Neuman, 2011; Oppenheim, 1992).
- **Validity** is about truthfulness, which refers to matching a construct, or conceptual definitions with a specific measure. It is, thus, concerned with the integrity of the conclusions that are generated from a piece of research (Bryman & Bell, 2011; Neuman, 2012). In designing and selecting research techniques this is often related to questions about whether the question, item or score measures and what it is to measure (Oppenheim, 1992)

In this context, those concepts are featured differently depending upon the type of research approaches (i.e. qualitative and quantitative) because different research approaches are required of different paths of data collection and the analysis in a certain boundary of epistemological and ontological debates (summarized in Table 3.4). In this connection, it is inevitable for researchers to be concerned about generativity issues which are derived from each methodological ground (Easterby-Smith et al., 2012).

The next section will discuss the detailed philosophical position of this study that leads to a specific research methodology, reasoning process and data analysis strategy.

Research strategies	Quantitative		Qualitative	
Ontology	Realism	Internal Realism	Relativism	Nominalism
Epistemology	Strong positivism	Positivism	Constructionism	Strong constructionism
Approaches to methodologies	Deductive with natural science model		Inductive relying on interpretation of emergent social world	
Aims	Discovery	Exposure	Convergence	Invention
Starting points	Hypotheses	Propositions	Questions	Critique
Designs	Experiment	Large surveys; multi-cases	Cases and surveys	Engagement and reflexivity
Data types	Numbers and facts	Numbers and words	Words and numbers	Discourse and experiences
Analysis/ interpretation	Verification/falsification	Correlations and regression	Triangulation and comparison	Sense-making; understanding
Outcomes	Confirmation of theories	Theory testing and generation	Theory generation	New insights and actions
Validity	***Do the measures correspond closely to reality?***		***Does the study clearly gain access to the experiences of those in the research setting?***	
Reliability	***Will the measures yield the same results on other occasions?***		***Is there transparency in how sense was made from the raw data?***	
Generalizability	***To what extent does the study confirm or contradict existing findings in the same field?***		***Do the concepts and constructs derived from this study have any relevant to other setting?***	

Table 3.4 Qualitative and quantitative approaches and the philosophical orientations

(adapted from Easterby-Smith et al.,2012; Bryman & Bell, 2011)

3.2. Philosophical positioning of the research

In accordance with the steps of a research design process (Fig. 3.1) the following sections will outline and conceptualize the specific epistemological stances (pragmatism) that apply to this study. This is in consideration of the multiple research domains of this research as concerned with rigorous research setting. This will subsequently affect the logical arrangement of the research methodology, such as the application of research methods and approaches to data analysis. This study is posited in the pragmatism paradigm as related to design research. The following sections will address the reasons why this research is posited in this paradigm and how a research methodology will be set for this study.

3.2.1. Pragmatic approaches to Design Research

Distinction of 'design' from science in pragmatism approaches

Design research takes place in research domains that are not easily replicated with a traditional scientific paradigm, which is related to human enactment: e.g. humans' material practices, the actions and the domains. The problematic situations arise from the different contexts of human affairs and they are not alike. These types of studies are not able to be confirmed empirically as they rely on the implementation of human knowledge-based action, so they are rarely legitimised in a scientific way (Argyris, 1985, p.4) because such human action can be said to be a processing of people's own

relevant information that tacitly constructs their own meaning in achieving their own goals, like a designer's action (Argyris, 1985; Romme, 2003). For those reasons, much scholarly literature has discussed that design and organization studies are rooted in a common epistemological stance (i.e. pragmatism), where ill-defined human enactment is involved (see also section 2.1.1) (van Aken, 2004; Simon, 1996; Romme, 2003; Denyer et al., 2008; Easterby-Smith et al., 2012).

In consideration of the continuing debates regarding such ontological and epistemological issues (Section 3.1.5), pragmatism approaches have also been situated in such debates, distinguishing the concept from the scientific viewpoint as follows:

- **Scientific approach** is processed through methods, information components and information transformations (Wallace, 1971). A theory is translated into *hypothesis* with deduction and then it becomes transformed into observables by confirming a given theory as a hypothesis. Or, research outcomes are translated into new empirical generations. Induction: a theory is to be generated through empirical observations. Testing therefore carries out the two scientific approaches: confirming or rejecting '*hypotheses'*, and it is followed by acceptance, modification or rejection of a given theory (Wallace, 1971; Easterby-Smith et al., 2012). So, it underlines that all given conditions and contexts surrounding a research domain are stable and the boundaries and preferences of the results of the approaches can be completed and specified through the stabilizing process (Garud et al., 2008).

- However, the **pragmatism viewpoint, especially in design studies** covers the paradoxical situations of the dynamics of humans' design inquiries (Garud et al., 2008; Scheuer, 2010; Romme, 2003). This was developed by Simon (1996) in the roots of theories developed by Dewey (1938; 1948), revealing that a concept, an artificial science that is made by man, is distinguished from the natural sciences - developing valid knowledge on natural objects (van Aken, 2007; Romme, 2003; Easterby-Smith et al., 2012). Unlike radical relativists who believe that neither version nor interpretation can be proven or that any assumptions cannot be given, **pragmatists addressed theories on the basis of the explanatory paradigm, aimed at describing, explaining and predicting** the establishment of construction or improvement problems as underlining the lived experience - social knowledge that is to be 'cumulative' through human's experiences - in a dynamic cultural matrix (Corbin & Strauss, 2008).

With an understanding of this, design methodologists attempted to specify a relationship between science and design in design practices such as the pragmatism paradigm (e.g. Krippendorff, 2006; Cross, 2001). The brief logic that this study has considered includes:

- Pragmatists focus on the concept of actual human living and the problematic situations where design inquiries are involved. These are not placed in fixed environments, but are characterized by continual changes, unclear system boundaries and heterogeneous and continually evolving user preferences; continual incompleteness moving towards completeness (Barry & Rerup, 2006; Garud et al., 2008).

- The pragmatist paradigm thus rejects the incompatibility thesis that qualitative and quantitative research cannot be compatible (full deduction or induction). It neither accepts pre-determined theories and the frameworks that shape knowledge and truth nor the own truths constructed by people (Easterby-Smith et al., 2012; see also Figure 3.2). Pragmatists believe that new knowledge was provisional until checked out empirically by peers (Corbin & Strauss, 2008).

- In association with the above, design methodologists contend that the ultimate missions in design are aimed to develop design knowledge, and the knowledge can be used in 'designing' solutions in the field in question (van Aken, 2004). In relation to this, Romme (2003) stresses design as an ideal mode of research as such knowledge can be developed in the service of action. The nature of design thinking is normative and synthesis in nature – directed towards desired situations and systems and towards synthesis in the form of actual actions using the existing system for a solution at the moment (ibid, p.563).

- These epistemological underpinnings have therefore been applied to human enactment in relevant studies, such as design studies, organization studies and management science, with a focus on theories about 'human action'. Like designers, the focus is on how to change and/or create artificial objects as research outcomes, rather than analyse and diagnose existing objects (Argyris, 1985; Romme, 2003; van Aken, 2007; van Aken, 2004). As they are associated with man-made artefacts (i.e. artificial objects and organization) these can be said to be socially constructed ones that involve ill-defined human inquiries (Olsen & Heaton, 2010; Bærenholdt et al., 2010).

In conclusion, design research placed in pragmatism is neither focused on generating theory nor on replication as pure scientific approaches have done. Yet, as carried out by designers, design research is focused on theory development (Georges & Romme, 2003). In this study, this design research mode is defined as design epistemology to be applied to a series of research design frames: setting research methodology; choosing research methods; reasoning processes and approaches to data analysis.

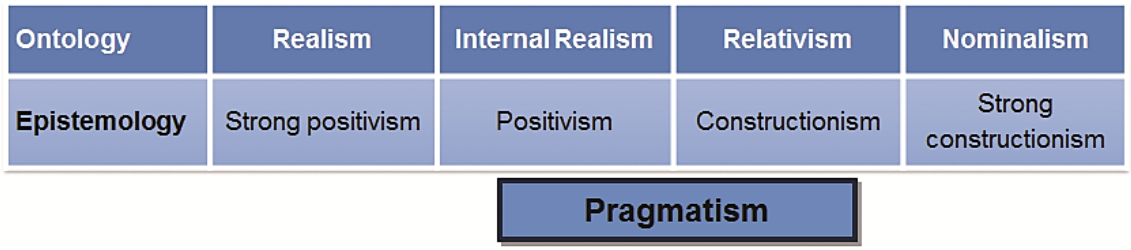


Figure 3.2 Mapping Pragmatism against ontological and epistemological implications (Easterby-Smith et al., 2012)

3.2.2. Cross-cultural organization studies in the Pragmatism Paradigm

The pragmatism approaches and design epistemology are also applied not only to design and organization studies, but also to international and cross-cultural organization studies. This section provides a basic understanding of cross-cultural and international studies in order to explain how they can be studied in the design research paradigm.

Usunier (1998) presented the significances of methodological considerations in international and cross-cultural studies with the following reasons:

- **Ethnocentric issues:** cross-cultural and international studies are often started with a lack of understanding of the research paradigm and of epistemological concerns. It often takes place in an ethnocentric manner: the researcher's sympathy and familiarity to the cultures researched leads research from the researcher's own cultural perspectives to influence the research design, data collection, interpretation, and analysis.
- **Replication:** results of cross-cultural and international studies have been featured in a replication of one dominant cultural study to a second culture (Adler, 1983a; Adler, 1983b; Usunier, 1998), as the researchers often approach cross-cultural study with the particular reasons that their taken-for-granted cultural background of the research is just different from the researched field and informants. Yet, this results in de-contextualization from complex reality. Usunier (1998) thus stresses the significance of awareness of a context that research involves (e.g. nations, cultures, individuals, organizations, or studies themselves) to reduce the risks of simple replication of a previous research approach, because this can cause another challenge about the ambiguous relationship between conceptual simplicity and measurability in data analysis.

In relation to those issues, understanding of a concept of 'difference' is underlined in research design of cross-cultural and international studies and this leads to considering 1) **de-stereotyping** and 2) **Etic-Emic issues** in order for the researcher to understand 'the contexts' that lie in this study.

- **De-stereotyping**: differences do not occur in the East and West, but it can also happen within either East Asia or the Western European business culture, because there are still differences even

within the eastern Asian culture (see section 2.3.4; and also Alston, 1989). Usunier (1989) answered this by providing the simple example about cross-cultural studies in the East and West to help understand de-stereotyping as follows:

> "De-stereotyping helps to avoid broad generalizations about the management style of a large group of countries, seemingly similar, at least as seen from Europe or the USA. For example, a study of Korean management allows fine tuning of the influence of Confucian philosophy on Far-East Asian management styles by comparing China, Japan and Korea […] Another avenue for de-stereotyping ideal types is to search for an increased in-depth understanding of their underlying dimensions." (Usunier, 1998; p.87)

- **Emic versus Etic:** Understanding these terms is important in cross-cultural and international studies. The terms originated from linguistics studies. Emic refers to the sounds within a language, which can be distinguished by speakers of that language (differences in natures due to different concepts of those), whereas Etic is regarded as features of a language that are easily identified by outsiders (different from universal perspectives), but largely soundless to people who speak that language. This principle can be applied to international and cross-cultural studies in order to understand how a researcher significantly understands issues of 'differences' and how he/she perceives such things from a moderate researcher's perspective for best conducting a cross-cultural study (Easterby-Smith et al., 2012; Usunier, 1998; see Table 3.5).

	Underlying research approaches	Differences perceived
Emic	•Attitudinal or behavioural phenomena are expressed in a unique way in each culture. Taken to its extreme, this approach states that no comparisons are possible •Provides data with greater internal validity, so that it is at the expense of cross national comparability and external validity, in which the results are not transposable to other cultural contexts	•Looking for specific differences in natures •Difference can be in nature : e.g. fully different concept (meaning of the term) of 'decision-making' (incommensurable) in Japanese decision making
Etic	•Concerned with identifying universals •Emphasizes culture-free test and the test is applicable to several cultures	•Looking for differences applied to the universal •Emphasizing finding out differences regarding measurement of the degree- if scalable, operationalized, and measurable on common conceptual dimension •Differences can also be in degree: Whether given concept is scalable, ordinarily or cardinally

Table 3.5 Research Strategies in cross-cultural studies (Usunier, 1998)

In relation to this, Usunier (1998) stressed that international and cross-cultural study is characterized as **comparative studies** emphasizing **'comparison'** across cultures. The meaning of comparison thereby contains two aspects which examine **resemblance or differences; to be the same or similar; similarities are central** in the comparison process as well as differences.

The issues of the concept of 'comparison' are because of 'generalization' in cross-cultural study, whether cross national laws exist, or whether there is any possibility of generalization across cultures etc. (Usunier, 1998). Everything can be either different or similar: something is in favour of not confounding highly visible differences (Farley & Lehmann, 1994; Usunier, 1998). As opposed to this, there is a different viewpoint. Searching the universal variables' relationship and knowledge implies finding similarities for generalization only, so that it cannot be a starting point of cross-cultural study, but that is only the research aims, since generalized findings in cross-national research would not be complete and are still limited (L.C.Cheng, 1994; AMADO et al., 1991; Usunier, 1998).

For those reasons, comparative studies are seen as varied types of approaches, depending on theoretical underpinnings: whether the theory attempts to define and to derive operationalized variables; whether to look for a theorized relationship among variables; or whether to seek a generalizability of the measurement process by testing the relationships etc. (Usunier, 1998). This implies that comparative studies are underlined in understanding of 'complexity' and 'emergent reality', because generalising about culture cannot be accomplished in a scientific approach and the attempts and obsession of generalization can result in 'reductionism' and 'incomplete meaning'. Hence, the realities emerging from cross-cultural generalization can only be achieved by the multi-studies with multiple research perspectives and comprehensive understanding of certain phenomena (ibid).

Based on this, the next section will discuss the idea that cross-cultural organization studies can comply with design epistemology in the pragmatism realm.

3.2.3. Design Epistemology encompassing Cross-Cultural Organization studies and Design Studies

The epistemological understanding about design research leads to consider how the design research paradigm can embrace even cross-cultural organization studies as the best research mode. The reasons are addressed as follows**:**

1) **Design as an inter-disciplinary activity:** design underpins the process of solving fuzzy problematic situations through the making of artificial things (Georges & Romme, 2003; Scheuer, 2010). The design practices are thus characterized as creative, idiosyncratic and multiple perspectives and the solutions in this light enables direction of a specific goal for the moment that a problematic situation is enacted (Olsen & Heaton, 2010). For that reason, design methodologies should be featured in **hybrid, collaborative, explicit, open, and collective experiments** to create various solutions, from material solutions including products and technologies to immaterial ones such as processes, services and even creative efforts. All

those are driven with hybrid and inter-disciplinary approaches holding blurred boundaries across professions (Buchanan, 2001; Cross, 2006; Georges & Romme, 2003). Each goal is achieved by **synthesizing** the diverse contents and methods, rather than specific scientific analysis (Scheuer, 2010; Simon, 1996). It infers that design can be said to be the best inter-disciplinary research approach.

2) **Design as a system thinking-based discipline:** In order to deal with complicated human enactment, design employs systems thinking (note the section 2.1.3). A design process itself is involved in a process of achieving objective activities by shifting from an abstract to a material form. System thinking is a necessary prerequisite to classify from heterogeneous objects to homogeneous populations (McKelvey, 1982; Checkland & Scholes, 2007) because it enables the capture of unique problems and essential elements from the complexity even with limited information throughout the classification process (Romme, 2003). It can be found in the common arena between design, organization and international culture studies.

   Firstly, **human-material practice studies** that contain human enactment (i.e. design and organization) cope with the nature of **complexity** of materials as well as immaterial things that cause concerns about generalizability. The solution for each problem is not easy to replicate (i.e. validation) in a positivist's scientific generalization (Romme, 2003; Scheuer, 2010). McKelvey (1982) therefore suggested a **simplification** process with **classification** approaches such as taxonomy, typology and classification in terms of a systematic thinking approach. For those reasons, classification for simplification has been often employed in man's material relevant studies, new product development, organization change management, etc. (Langrish, 1993), because it can contribute to finding new solutions to complex problematic situations in complex systems by utilising limited information from the large system (Romme, 2003).

   Likewise, **cross-cultural study** is often constrained by the **complexity issues** of its research domains and it often leads to replication of previous studies (Usunier, 1998). In international and cross-cultural studies '**simplification'** approaches are therefore also suggested to deal with those complexity issues through a **disentanglement process** for feasible cross-cultural research projects. There are two ways of using a disentanglement process for simplification: ***Maximin*** *- considers all large numbers of variables, concepts, units, etc. and then those constructs are reduced to the minimal set to achieve the research objectives*; ***Minimal*** *- begins with feasible minimised constructs and then progressively increases the degree of complexity in order to bring relevance and feasibility up to a maximum point:* ***Minimax (ibid).*** By doing so **de-stereotyping** effects are also expected.

3) Design as an iterative processing activity: a design process uses **iterative and nonlinear** approaches to achieve its goal that arises from the **'complexity' of human issues**. Design practices

aim to improve the quality of human being's artificial things through the constant observation of an unknown ambiguous environment (Olsen & Heaton, 2010). It is thus necessarily characterized as iterative to reduce the increasing ambiguities (see also Simonsen & Hertzum, 2010). It is therefore often utilised as a means of action for experiments to become closer to a scientific approach. Empirical findings for accepting or rejecting a hypothesis can be reformulated in design propositions through redefining descriptive variables by maximizing analogical thinking (Romme, 2003).

To sum up, this research that lies in complex relevant human issues on cross-cultural organization and design practices employs 'design' as the best research modes. **It can deal with emergent complexity from varied contexts and variables that cannot be generalised or validated in a traditional positivist research approach or pure constructionism.** The next section will discuss how this research paradigm is employed in establishing a research methodology for this study.

Research Design approach	Cross-cultural study	Human's material practice study: Design and Organization
Considerations of underlying assumptions	• Complexity and emergent reality derived from diverse variables and contexts internationally • The etic and emic considered- similarity and differences	• Complexity entailing all environments that support given human material practice • Mostly, pre-paradigmatic study
Considerations in research design	• Multiple perspective required • Simplification with disentanglement required • Considering de-stereotyping among units to be studied	• Multiple perspective required: hybrid, collaborative, open, collective • Simplification with categorisation required • Systems thinking based
Pragmatism-based Design Research	• Multiple and hybrid approach: inter-disciplinary • Systematic thinking approach given • Iteration-based processing	

Table 3.6 Justification of Selected Research paradigm

3.3. Setting research methodology: case study

3.3.1. Justification of choosing case study by epistemological consideration

This section discusses a key research methodology for this study. With an understanding of pragmatism and the design research mode (Section 3.2.) this research employs the case study methodology that can cover the complexity of design and organization studies. In terms of pragmatism stances, this study takes several benefits from the case study methodology, which is

hardly generalised with any scientific approaches. The generic features that support the reasons why a case study is employed for this study are presented as follows:

Firstly, case study is neither posited in traditional scientific stances: realism, nor naïve relativism in its ontological views. Scholarly methodology researchers view case study as moderate constructionism (Järvensivu & Törnroos, 2010) or somewhere in an intermediate position between constructivist and positivist (Eisenhardt & Graebner, 2007; Easterby-Smith et al., 2012).
Due to the intermediate positions, case study provides not only significant benefits in generating a theory drawn from rich pictures for eclectic relevant human research (i.e. organization and design), but also significant concerns on a degree of validity of a research project (Easterby-Smith et al., 2012; Bryman & Bell, 2011). Yin (2002) stressed that rigour and the application of logic in research data are significant for a degree of validity as limited numbers of specific cases are generalised in the interpretation of data, whereas researchers such as Stake (2006) and Siggelkow (2007) whose points of orientation rather lie on the qualitative and constructivist sides tend to ignore those rigours and saliences of research. They are more concerned about providing a rich picture of human life that is not easily replicated by others, so the latter ones tend to demonstrate important particular research questions for the inspiration of new ideas and the illustration of those abstract concepts (Easterby-Smith et al., 2012).
However, taking both positivist and constructionists sides, the consensual point is that case study can offer insightful and contextual issues with flexible adaption of research using diverse research methods and the sources that can cover eclectic human affairs and its complexities (Eisenhardt & Graebner, 2007; Yin, 2009; Stake, 2005).
For those reasons, case study is not denoted as a **methodological choice** but as **a choice of what is to be studied** (Stake, 2005). For those reasons, generalization is not significantly emphasized fully in scientific approaches, for instance numeric labelling and taxonomy like physics or biology, but it is rather aimed at theory development, building and generation by providing rooms to create theoretical constructs, propositions and/or midrange theory from cases (Langrish, 1993; Stake, 2005; Eisenhardt & Graebner, 2007).
With this understanding, the next sections will discuss the detailed research design for case study.

3.3.2. Research Design Strategy for Salient Case Study: Multiple or Single Case Study

This research is designed to maximize analogical thinking and the reasoning, using multiple case studies to examine underlying human enactment issues that exist in this research domain.

Yin (2009) notes that in social science there have been neither comprehensive theories on case study development like science schools such as biology or psychology nor has it been codified. Within this context, much literature on case study has debated its methodological grounds and the epistemological underpinning (i.e. positivist, constructivist or both positivist and constructionist). This leads to debates about how many cases should be studied for rigour: single or multiple cases (e.g. Bryman & Bell, 2011; Yin, 2009; Easterby-Smith et al., 2012).

It is important to discuss whether the research uses single case or multiple cases because the choice of numbers of cases can result in a certain level of rigour in the research. This is still the subject of on-going debates because of generalizability issues, especially when such ill-defined human conditions as organizations and design are studied. Those conditions are not fully replicated in other cases (section 3.1.1). For that reason, it is inevitable that there are controversial debates about reliability, replicability and validity, dependent upon the research setting's design and the approaches (Yin, 2009; Bryman & Bell, 2011). Yin (2009) justifies when and how single or multiple case studies are applied to a research project as follows in Table 3.7:

Single–case studies	Multiple-case studies
When a single case only represents • A critical test of existing theory • A rare or unique circumstance • A representative or typical case or the case provides revelatory or a longitudinal purpose	The studies follow a replication, not sampling logic • In the sampling logic the methods applied are pure positivist approaches, including survey or statistical data. • Sampling logic views the resulting data as representing the entire universe or pool. • For the replication procedures the theoretical framework is needed, which can state whether the results of the case study are likely to be found (a literal replication) or are not likely to be found (a theoretical replication). • Extensive resources and time are required. • Each case in a procedure of replication of a case study is carefully chosen in consideration of following results of each case: a result of a case study is predicted to be similar to results of other cases (a literal replication) ,or be contrasting with the results for reasons which can be anticipated (a theoretical replication).

Table 3.7 Single and Multiple-case studies (adapted from Yin, 2009; Bryman & Bell, 2011)

Despite the continuing controversy about the numbers of cases, in general, a multiple-case design has been shown to provide rigorous research outcomes by contrasting and comparing findings from each case. The reasons are addressed as follows:

- **Single case study:** it offers detailed and intensive analysis of a single case including an organization, location, person or event (Bryman & Bell, 2011). Yet, a single case study is still vulnerable, because studying a selected single case does not fully explain how the case is unique or if the surroundings of the case are artificial conditions created by the researcher or some other parties. Therefore, single case studies are likely to attract criticism and scepticism unless they provide a strong justifiable argument (Yin, 2009; Bryman & Bell, 2011).
- **Multiple-case studies**: it allows awareness of what is unique or common in each case by looking into different cases at the same time. By doing so, it can promote multiple theoretical reflections on the research findings. So, multiple-case studies are often usefully employed in comparative studies, like cross-cultural studies in business and management research (Bryman & Bell, 2011).

Taking into account these factors, Yin (2009) therefore provides a matrix that illustrates four specific types of designs of case study by the numbers of case: **holistic multiple-case designs and embedded multiple-case designs** (Table 3.8). Before debating the issues of vulnerability or generalizability, the matrix helps to consider the different contextual conditions of the research taking place in topics relevant to human enactment such as design and organizational culture studies. In relation to this, the next section will discuss the more detailed issues of generalizability, reliability and validity emerging from case study (note also section 3.1.7).

	Single-case designs	Multiple-case designs
Holistic (single unit of analysis)	• To analyse one single case in one contextual condition • Research outcomes are drawn from analysis of a subunit of one case (i.e. an embedded unit of a case): e.g. researching a universal nature of a case • A single unit somehow should logically represent a case • Yet detailed specific phenomenon of a single unit and a case are often challenged to be applied to other cases, so that a research project is conducted at an abstract level with lack of measurement • Research questions likely emerge from different contexts as a study proceeds: hardly found specific evidence due to the fuzzy and messy process in emergent questioning	• To analyse multiple cases in each case of the case (i.e. contexts are also multiple)
Embedded (multiple units of analysis)	• To analyse multiple embedded units in one contextual condition • Research outcomes are derived from analysis of multiple subunits of one case (i.e. embedded units of a case) • Available to increase robustness of case study by investing subunits, protecting unexpected questioning • Yet, likely to ignore returning to analysis of larger contexts of a case due to too much attention to study of subunits	• To analyse multiple embedded units in the case of the groups of the embedded units, and the cases to be analysed are also multiple in multiple contextual conditions • Study of the embedded units is likely to use scientific methods for replication (e.g. quantitative data including survey or archival data)

Table 3.8 Four types of Design of Case Studies **(Yin, 2009)**

3.3.3. Theory and Case Study

Any research design for social sciences presents a logical set of statements and the quality of the research design is determined by the logical tests. The logic is tested by consideration of major concepts, trustworthiness, credibility, conformability and data dependability especially in social science (Yin, 2009). However, case study as a research methodology has been controversial in terms of its philosophical stances, whether it comes from the positivist viewpoint or can be applied to relativist and constructionist perspectives, since case study is designed for in-depth research on a small number of cases (i.e. organization, individual, events) for building or suggesting new theory, rather than theory saturation (Easterby-Smith et al., 2012; Stake, 2005; Eisenhardt & Graebner, 2007). In this sense, this study uses **construct validity** that employs multiple sources to provide evidence, whilst collecting and interpreting the data sources (Riege, 2003; Yin, 2009).

Research outcomes drawn from a case study are not easily evaluated fully from the positivist perspective. The major purpose of a case study is to provide a collection of insightful and contextual data with qualitative data sources, such as numerous interviews from numbers of individuals that can represent events and organizations regarding ill-defined relevant human issues (Stake, 2006). For that reason, there are still continuing debates between constructionist and positivist researchers regarding the rigour of case study (e.g. Stake, 2005; Yin, 2009; Easterby-Smith et al., 2012). It also infers that the approaches to theory in a research project can differ depending on an initial philosophical consideration as well as the aim to be studied in the research.

In this sense, it is important for a case study to contain rigour and careful logic much the same as the level of positivist approaches with the consideration of validity and reliability issues (Easterby-Smith et al., 2012; Yin, 2009) (see Table 3.9). The quality of a research design is therefore determined by how it is tested. It is often discussed in the four areas: **construct validity; internal validity; external validity; and reliability**.

Taking into account these factors, **construct validity** is to be considered for the rigour of this research that, to a certain extent, reaches positivists' robustness (Riege M, 2003). For this research design, this study's aim is not focused on explanatory accounts, nor identifying a causal relationship between research findings, since implicit human condition and consciousness issues regarding organizational cultures and practices on man-made materials are not easily generalized. **Construct validity** is therefore an adequate approach for building a theoretical argument, using multiple sources and reviews. Based on this, the next section will discuss the adaptation of research methods; i.e. multiple data sources for construct validity, which can fit a rigorous case study methodology as well as its epistemological stances.

Tests	Details	Case study tactic	Phase of research in which tactic occurs
Construct validity	• Identifying correct operational measures for the concepts being studied	• Use multiple sources of evidence • Establish chain of evidence • Have key informants review draft case study report	• **Data collection** • **Data collection** • **Composition**
Internal validity	• Mostly for explanatory or causal studies only and not for descriptive or exploratory studies • Aimed to establish a causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious relationship	• Do pattern matching • Do explanation building • Address rival explanations • Use logic models	• **Data analysis** • **Data analysis** • **Data analysis** • **Data analysis**
External validity	• Defining the domain to which a study's findings can be generalized	• Use theory in single-case studies • Use replication logic in multiple-case studies	• **Research design** • **Research design**
Reliability	• Demonstrating that the operations of a study – such as the data collection procedures – can be repeated, with the same results	• Use case study protocol • Develop case study database	• **Data collection** • **Data collection**

Table 3.9 Four tests for case study research design and the tactics **(Yin, 2009)**

3.4. Application of Research Design

3.4.1. Distinction of Research Phases

This study was undertaken using an abductive reasoning process in alignment with the chosen epistemological position – pragmatism – and the research methodology – case study – in consideration of the design research modes. To do so, this research is divided into two stages for the best abductive reasoning. Theory matching and suggestion are discussed in alignment with the abductive reasoning loop: **Phase I focused on a pilot test and exploratory studies** and **Phase II for the main study**.

In accordance with the distinguishing stages of a research process, the data sources to be used are determined at each phase. This provides the rigidity of this study that is to demonstrate the unwritten stories on organizational cultures in design practices. In fact, in organizational culture studies the combination of multiple data sources – qualitative and quantitative – at different stages of the research process can allow cross-checking of data; and the conjunction helps to access different levels of reality: e.g. tacit understanding of unwritten organizational cultures and written evidence in

documents (Bryman, 1995: p.176). Which data sources are to be used in each stage and the details are presented as follows:

(1) Phase I Development of a conceptual research framework

A Pilot study aims to increase the rigour of this study by providing the initial motives to establish the purpose of this research (Oppenheim, 1992). However, for this study it is encompassed in **exploratory studies**, so that this phase offers the initial research constructs to generate analytical categories and the overall dimensions of other research phases (see Strauss, 1987; Strauss & Corbin,1998; Easterby-Smith et al., 2012) by employing the semi-structured type of **open-ended email interviews**. It also tests the initial assumption as **prior theoretical knowledge** (Langrish, 1993; Kovács & Spens, 2005) (i.e. the set of research frameworks in section 2.5.). By doing so, this research can reduce the concerns and criticism of the pure constructionist approach that data is collected from a pure data set and avoid pre-suppositions (see Glaser, 1978, 1992).

(2) Phase II Examination toward Theory Suggestion

On the basis of the results of Phase I, the research methods and approaches are reformulated in Phase II, the main study. This phase includes the subsequent phases that Langrish (1993) suggested (i.e. stating case studies; writing to a named person inside an organization; feedback; and adding up). In order to draw meaningful insights and questions, this research chose mixed methods that can maximise the analogical process (To be presented in section 3.4.2), rather than following homogeneous methods: **in-depth interviews with design professionals to draw tacit understanding of organizational cultures in design practices and scrutinising secondary data sources in support of the primary data sources.**

This phase aims to draw insightful research outcomes for theory suggestion. For this, comparing to prior theoretical knowledge (i.e. the set of research framework), deviating real-life observation and theory matching are conducted in accordance with the abductive research process (Kovács & Spens, 2005). By doing so, this phase identifies and clarifies actual issues about the given research questions. Based on the discussion of the findings from this phase, design management models will be presented about how approaches to managing design have been shown differently in large organizations in the East and West as the theory suggests.

3.4.2. Application of methods: mixed method and data collection

3.4.2.1. Choosing Mixed Method

The major benefits of case study are that the research design is flexible in the adaptation of research, and so multiple methods can be employed for data collection in conducting case studies and the analysis (Eisenhardt & Graebner, 2007; Yin, 2002; Stake, 2005). On the other hand, there are still controversial debates between the qualitative and quantitative approaches in terms of a connection between their epistemological and technical versions used in research (Bryman & Bell, 2011). In this connection, there has been increasing interest in employing the mixed methods model for the following reasons.

- Firstly, this model can generate and reformulate research questions through multiple methods, and then it can provide warranted answers (Johnson & Onwuegbuzi, 2004; Onwuegbuzie et al., 2009; Bryman & Bell, 2011). Through this, mixed methods research can entail triangulation, complementarity, initiation, development and expansion in terms of the rigour of research (Johnson & Onwuegbuzi, 2004). This can also help triangulate research properties to be generated (Jick, 1979; Cohen et al., 2007; Corbin & Strauss, 1990).
- Accordingly, case study itself emphasises the use of mixed methods (Yin, 2009) and these can be said to be rigid **hermeneutical** approaches towards most robust research outcomes (Stake, 2005). In fact, these approaches can cover a whole range of qualitative and quantitative data collection as well as the analyses (i.e. descriptive, explanatory and exploratory analytical techniques). Also, it generates substantive research questions and warranted answers to those questions. The process and attempt to fulfil one another can be regarded as a **pragmatist paradigm** in its own way (Onwuegbuzie et al., 2009; Onwuegbuzie & Leech, 2005).
- Thirdly, social sciences including enacted human behaviour studies, such as organization and business studies, look into the in-depth reality of a research domain. This cannot be validated with deductive logics and the methods (Onwuegbuzie et al., 2009). For those studies, a combination of multiple methods is essential for method triangulation and it can construct validity (Yin, 2009) by taking advantage of the methodological benefits of both qualitative methods (e.g. interviews) and quantitative ones (e.g. existing documentation and archival data or surveys). By doing so, a researcher can check the information multiple times throughout a process of complementing data sources (Velde et al., 2004).

On this basis, we employed multiple methods from varied types of data sources from accessing design experts and professionals for survey methods (i.e. email and in-depth interviews) to searching a range of online and secondary data sources to triangulate the chosen methods (i.e. construct validity) in **a sequential step**, rather than concurrent steps. This is the **sequential qualitative-dominant mixed method**, which can cover quantitative and qualitative epistemological benefits (Johnson & Onwuegbuzi, 2004; Bryman & Bell, 2011). This model especially benefits this study as the qualitative

data source can provide in-depth knowledge of social contexts and a certain hypothesis, and the quantitative data sources can aid measurement for endorsing the data sources acquired through qualitative research (Bryman & Bell, 2011).

The following sections will address the methods to be used for this research and discuss the justification of those methods employed.

3.4.2.2. Choosing methods

In accordance with the distinguished research phases, the methods for data collection are also employed differently in the two phases: **a pilot study and a main study**. The methods this study choses are also developed and labelled in order to underpin this study's epistemological stances**: (1) the survey research method: semi-structured email and in-depth expert interviews (qualitative data sources); (2) secondary data (quantitative and qualitative sources): documentation and archival records.**

(1) ***Survey research***

In qualitative research there is still confusion about the use of terms such as **interview, survey, and questionnaire**. These are often used in different ways with little clear explanation of the detail and a lack of codified definitions of those terms (e.g. Easterby-Smith et al., 2012; Velde et al., 2004; Oppenheim, 1992). For example, structured interviewing is used for quantitative research, yet structured, unstructured, and semi-structured are all addressed in qualitative research (e.g. Myers, 2009; Bryman & Bell, 2011: see Table 3.10). However, this thesis labels all these methods employed in data collection as the survey research, alternatively, as this study takes into account following aspects of survey.

- **To take advantage of positivist aspects:** Survey is often illustrated as a dominant method for quantitative-centric research that aims to identify certain regularity in a population or a case because it recruits a large-sized sample to generalize a certain pattern between them within the boundary of the positivist approach (see Oppenheim, 1992; Easterby-Smith et al., 2012). In this connection, **survey** is often described as synonymous with **cross-sectional design** as it collects the data in connection with two or more variables (usually more than two) in a certain structured way (e.g. structured interview or questionnaire) (Bryman & Bell, 2011; Easterby-Smith et al., 2012). However, survey research comprises cross-sectional design and it is rather viewed as an approach to research design in the following definition.

  "Survey research comprises a cross-sectional design in relation to which data are collected predominantly by questionnaire or by structured interview on more than one case and at a single

point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables, which are then examined to detect patterns of association." (Bryman & Bell, 2011)

As stated in the quotation, the term survey contains all the concepts of those terms, **interview, survey, and questionnaire**, so that survey can be said to be a type of approach to data collection, rather than a pure method. Therefore, this study can use its epistemological advantage for the rigour of this research.

- **To create new approaches to data collection:** In relation to the positivist methods, it is still unclear how the survey method is to be used for a specific research approach. Accordingly, the method is often challenged by criticism that the method is difficult to detect and explain the results in depth (Easterby-Smith et al., 2012). Whereas, in qualitative approaches the methods of data collection and tools are loosely specified and it is even requires creativity for a new research design (Easterby-Smith et al., 2012). In this sense, this study employed the survey data collection approach as it was considered to be a qualitative-centric mixed method application.

It is applied in the following two types of methods: **1) self-completion type of email and 2) face-to-face in-depth interview** (Bryman & Bell, 2011)**.**

1) **Self-completion type of email interview:** this study conducted online email interviews (embedded in Google Doc system) that were constructed through multiple pre-tests (see also Bryman & Bell, 2011). Sampling was developed from online networking in the social media domain, LinkedIn for professionals. That is also part of the generation of substantive research questions to be applied to the main study (To be discussed in section 3.4.3.3.). This method was employed with the following considerations:
    - In quantitative research approaches, the survey type of method has been controversial because of typical survey disadvantages, such as low response rates, difficulties in controlling respondents or the order to be answered. Yet, the survey has also advantages in terms of reducing interviewers' bias, so that this can answer the positivist researchers' debates that lean towards the rigour of natural scientific design (Oppenheim, 1992; Easterby-Smith et al., 2012).
    - With the focus of this epistemological stance, survey research can be posited not only in positivists' epistemological underpinning, within which deductive processes are allowed with hypothesis or propositions (see Easterby-Smith et al., 2012; Oppenheim, 1992), but also featured in hermeneutic nature, because the survey itself is developed by being articulated and refined through several pre-tests and pilot tests to reach the best-optimised measure (Oppenheim, 1992; Bryman & Bell, 2011).

- Regarding this hermeneutic nature, despite taking the position of the positivist, the use of an email and online-based survey also benefits from the constructivist method. The self-administered type of enquiry can cover respondents' anxieties about revealing sensitive organizational issues (Meho, 2006; Easterby-Smith et al., 2012; Bryman & Bell, 2011).
- Also, the web-based techniques can overcome issues of distance, and undertake better cross-cultural study (Meho, 2006; Bryman & Bell, 2011).

On this basis a **semi-structured** email survey was used **to generate analogical categories as guidance for the first phase of this research**, rather than generating scientific relevancies used in quantitative research (see also Oppenheim, 1992).

2) **In-depth expert interviews:** based on the analytical categories drawn from the pilot study, in-depth expert interviews were undertaken in the main study phase. The questions were constructed based on the questions regarding the implications of the pilot study (To be discussed in section 3.4.3.3.). For the use of this method, this study considered the following elements:
   - Interviews are often employed to identify in-depth knowledge, facts and opinions, and attitudes of individuals by directly asking respondents. Interview methods can be effective ways of understanding detailed situations or an exact chronology of events (Oppenheim, 1992; Easterby-Smith et al., 2012; Velde et al., 2004).
   - For that reason, the interview method is used in different ways for different research purposes with different techniques; such as explanatory interviews, including in-depth interviews, free-style interviews or group interviews and standardised interviews for public opinion polls, market research or government surveys (Oppenheim, 1992).
   - Especially, **in business and management research this can be used to gain in-depth insight into organizational realities using the language they use (called natural language data)** (Easterby-Smith et al., 2012) **and also based on the insight gained, it allows access to other types of sources and information such as documentation and archival records** (e.g. annual reports of companies: see the next (2) secondary data sources) as part of a preliminary study with an explorative question (Velde et al., 2004).

For this research, taking into account those advantages, as part of the data collection process in the mixed method approach, the interview method will offer a detailed and in-depth understanding about the given research questions. This will be provided based on the spontaneous insights of the experts (interviewees) with a focus on their heuristic sense (Oppenheim, 1992). In doing so, it can contribute to increasing the depth of data collected and this is also expected to increase the variety of dimensions of a given research topic (Easterby-Smith et al., 2012).

Structured	The use of pre-formulated questions, strictly regulated with regard to the order of the questions, and sometimes regulated with regard to the time available
Semi-structured	Questions asked are still in a range of specific topics The uses of some pre-formulated questions guided by such as an 'interview guide', but no strict adherence to them and flexible However, similar wordings are used to interviewee during interviewing New questions might emerge during conversation
Unstructured	Few if any pre-formulated questions. In effect interviewees have free rein to say what they want within a range of intended topics. Sometimes, a single question leads to suitable responses like conversation Often no set time limit

Table 3.10 Types of Survey research (adapted from Myers, 2009; Bryman & Bell, 2011)

(2) Secondary Data Sources

Multiple sets of secondary data can be considered to be major primary sources for case studies, including documentation, internal reports, autobiographies, books, printed newspapers and magazines. This documentary evidence can be analysed in multiple ways: **qualitative and quantitative; and recent events and historical ones**, dependent upon the types of data sources (see Bryman, 1995, p.189).

These types of data sources can be used for parts of empirical data sources **if they can be read, have not been produced for specific research, preserved for analysis and are relevant to a given research topic** (Bryman & Bell, 2011; Yin, 2009). These multiple data sources offer several benefits in support of mixed methods and case studies as follows.

- Jick (1979) contends that multiple secondary sources can help to triangulate and help shed light on the questions under examination (Jick, 1979; Corbin & Strauss, 1990). Therefore, they were used as main primary data sources in design and organization studies (e.g. Garud et al., 2008).
- It can help to approach studies that are in a continual changing context by embodying important primary documentary evidence at the interface of the private (subjective) and public (rather objective) sectors (Cohen et al., 2007) and then can provide a discourse that is delivered by texts implying social contexts and interactions (Johnstone, 2007).

In this sense, this study employs largely two types of secondary data sources as part of the primary data in the main study phase: **documentation and archival data sources** in support of qualitative research outcomes (i.e. in-depth interviews in the main study). The terms of the two data source types are often used synonymously, but they are distinguished in terms of the accessibility of data sources to

the planned case study, regarding frequency of use and a subject that stores data sources as follows (see also Yin, 2009):

- **Documentation sources** are included in a range of the following formats relevant to every case study topic including letters, memorandum, e-mail correspondence, personal documents, written reports, administrative documents (including other internal records), and mass media outputs such as newspapers and magazines (Bryman & Bell, 2011; Yin, 2009; Bryman, 1995). Furthermore, they are specified by several different types of documentary sources, such as official documents, organizational documents and personal documents not in the public domain as follows (Bryman & Bell, 2011; Scott, 1990):
    - **Public documents**: these can be fully accessible in public and produce a large amount of statistical information in quantitative format and textual material such as Acts of Parliament and official reports (Bryman & Bell, 2011).
    - **Not in public (personal documents) and organizational documents** are similar to official documents in their format, but the difference relates to the place of domain. The documents can be placed in the public domain, but can be inaccessible by the public in some way. For instance, personal documents such as diaries and letters. Also, a company's annual reports, mission statements, reports to shareholders, transcripts of chief executives' speeches, press releases, advertisements and public relations material in printed form and on the web can be in the public domain; whereas company newsletters, organizational charts, external consultancy reports, minutes of meetings, memos, internal and external correspondence, manuals for new recruits, policy statements and company regulations are not always fully accessible to external researchers (Scott, 1990; Bryman, 1995; Bryman & Bell, 2011).
- **Archival records** are to some extent similar to documentation sources, yet the sources are made and stored by more reliable institutions that specialize in quantifying data, such as research institutions, universities, national and local governmental bodies, and large corporations. For that reason, they are exhibited as quantitative format, such as collated statistical data, financial information and the flows about an organization, survey records and so on. Like documentation sources, it also includes a variety of written formats covering the printed version and computer files (e.g. advertisements, annual reports, reports to shareholders, press releases, and public relations material in printed or on the web) (Bryman, 1995; Bryman & Bell, 2011; Yin, 2009). Despite similar concerns to documentation sources (i.e. validity of sources and misuses of literal sources), the major benefits for carrying out rigid case studies that use mixed methods are significant. Since those archival sources are mostly produced with quantified figures, they are extensively retrievable and can be analysed quantitatively (Yin, 2009; Bryman, 1995). Therefore, they can provide much rigour in research.

However, these types of sources must be carefully used in terms of their validity. A document collected should not be accepted and used for its literal texts alone. However, with an understanding of these issues, documentation sources are still useful in case studies to corroborate and augment evidence from other sources (Yin, 2009). For this reason, the criteria for accessing the quality of documents should be underlined as follows (Bryman & Bell, 2011).

- **Authenticity**: is the evidence genuine and of unquestionable origin?
- **Credibility**: is the evidence free from error and distortion?
- **Representativeness:** is the evidence typical of its kind, and, if not, is the extent of its untypicality known?
- **Meaning:** is the evidence clear and comprehensible?

Considering these factors, the author argues that the use of secondary data sources is considered to be significant in design research that is often confusing because of its abstract nature. For instance, Ulrich's (1998) research on new product design used a wide range of quantified secondary data sources in his design studies, in order to measure the attributes of the design that drive manufacturing cost. He disassembled each product and created a bill of materials (BOM) and a feasible sequence of assembly operations, and observed a few attributes from the BOM and the piece parts. This was undertaken based on his assumption that product specifications represent an unambiguous agreement as to what the team will attempt to achieve in order to satisfy the customer's needs. He refined this as a type of research methodology in design studies called **product archaeology.**

With understandings of those data sources, they are justified for this research. The detailed process of data collection are presented in Table 3.11 and Figure 3.3.

	Sources	Strengths	Weakness	Source types used in this study	Research phase
Survey methods **:29 interviewees**	**Self-completion Email interview** **(questionnaire)**	• Targeted – focuses directly on research topic (especially useful for case study) • Insightful – provides perceived casual inferences and explanations	• Bias can happen if questions are poorly articulated • Concerned with poor responses and refused permission to interview • Concerned with precise recalling, transcribing and recording by taking time and energy • Issues of reflexivity: an interview is undertaken within a boundary of what interviewer wants to hear	• Semi-structured Person-to-person meeting interview (including web-based skype meeting)	**Phase I: Pilot study**
	In-depth interview				**Phase II: Main study**
Secondary Data Sources (+150 secondary data sources)	**Documentation**	• Stable as it can be reviewed repeatedly • Unobtrusive – not created as a result of the research • Exact references and details of event are addressed • A broad range of events or settings (span of time and events etc.) can be covered	• Retrievable issues: sometimes difficult to find • Accessibility: not all documents are deliberately withheld • Reporting bias: in case of unknown authors • Biased selectivity: If full ranges of documents are not collected	• News clippings and other articles appearing in the media and journal articles: the Economist and Harvard Business Review • Organizational charts in webpages • Books(biographies about founders and books; and history of organizations)	
	Archival records	Mostly same as documentation, and quantified and precise data can be yielded	• Mostly same as documentation but more concerned with accessibility issues as some archival records are not in public domain	• Corporate annual reports and earnings reports between 2007 and 2014 about selected cases: Apple, Google, Samsung, Sony	

Table 3.11 Justification of data sources (adapted from Bryman & Bell, 2011; Yin, 2002)

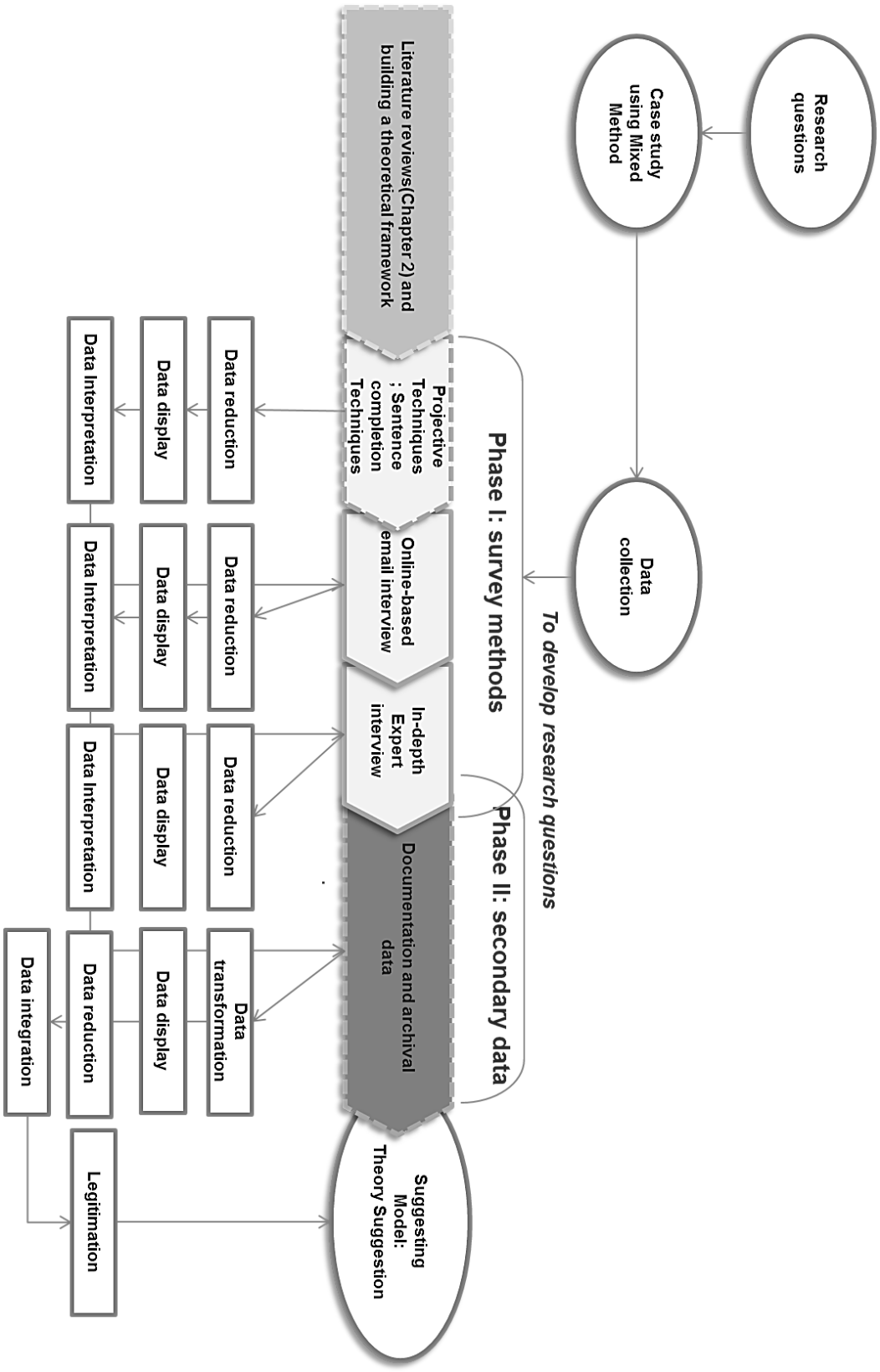


Figure 3.3 Data collection Process Detail

3.4.3. Data collection and the preparation

3.4.3.1. Data collection for Survey

3.4.3.1.1. Sampling and identification of interviewees

This study develops sampling strategy as considered about in multiple research traditions and characteristics in this research domains. Data collected in organization and business management studies are to some extents eclectic, subjective, nd partial organizational events; and accordingly a researcher hardly draws a perfect picture of inside organizational issues at all, because research participants in organization studies tend to describe only partial events of an organization on the surface. This is called 'process data' (Pentland, 1999). Sampling is thus a key issue to reduce emerging anxieties about criticisms of qualitative research because it can be criticised about insufficient sample sizes, ill-structured ways of recruiting the sample and lack of accounts of how to approach them (Bryman & Bell, 2011). In relation to this this thesis considers the following elements: (1) maximizing analogical thinking; (2) the research methodology of this study: embedded multiple-case design; and (3) data analysis strategy.

- ***Maximizing analogical thinking***: the idea comes from results of a piece of research . If a knowledge transfer body holds multiple cases this is more likely to facilitate such analogical encoding than a single-case holder (Loewenstein, et al., 1999). Then the multiple cases body more easily exhibits underlying patterns of the cases (Garud, et al., 2008; Loewenstein, et al., 1999). In other words, despite small-sized bodies, if it can be said to be a **representative body** it can be used to **maximise analogical reasoning** in a research project. For those reasons, this concept has been employed and verified in design and organizational studies by using exemplar cases (e.g. Garud et al., 2008). This research participants also stated this as below:

  "My company is product design agency, so we have worked with representative electronics companies such as 'S', 'L' and now we try to expand our areas to network companies such as 'K' as well as transportation areas too, for instance, an electronic bike development project. While in the past we had lots of physical design relating projects such as mobile phones, electronics products and television design and so on." […] now UX (user experience) relating projects increase. Because of that our contact teams have been changed so far. In the past, we had worked a lot with product design teams, whereas recently we work with UX and UI (user interface) teams and carry out lots of research and strategy relating projects." [SY]

- ***The research methodology, embedded-multiple case studies (Table 3.8; p.120):*** This is able to analyse multiple-embedded cases by looking at only limited numbers of cases that consist of other subsequent unit-cases. Each case has however also shared its own contexts and the entire cases can be therefore compared within the contexts with other cases (Yin, 2009). This study therefore draws

selected samples from a range of NPD project-based groups. Because of design project-based groups including NPD project groups, design studios and design consultancies can represent complex internal and external organizational structures and networks that show multiple interactions between members and organizations in carrying out design practices (note section 2.5.4.2.), as research participants stated below.

"Both two companies are large companies representing South Korea and they have diverse department. Unlike product design project that we usually contact with only in-house team in case of our project(service design) we have worked with a variety of departments ranging from strategy team to marketing and so on." [JT]

"(When carrying out a design project) not only the (design) researchers who conduct a research, also designer who is going to design a product…also…clients coming from …different departments, when their organization…to come together."[SW]

It infers that an experienced design project group now only shows aspects of a single design project at the moment, but an experienced design professional's responses also shows multiple cases of design projects, which she/he has done before. In other words, once questioned on cross-cultural issues and design projects, responses from an interviewee (as a unit) will reveal the multiple cases on the organizations' design projects they involved. This will be also addressed in consideration of the contexts surrounding the cases: i.e. the eastern and western organizational cultures.

- ***Data analysis strategy:*** this study's emphasis is focused on building a certain enacted organisational mechanism in design practices. Data relating to organisation and management issues – i.e. process data- only cannot be perfectly 'generalised' and 'reduced' due to the fact that respondents only state partial events. Discreet organizational issues the respondents concern are not allowed them to tell objectively (Pentland, 1999). This study thus focuses to build chronological and contextual details of the descriptions from the multiple cases, rather than simplifying and generalizing those in detail (Langley, 1999). A 'narrative strategy' is applied to this. This strategy is focused on 'constructing' a 'mechanism' (Pentland, 1999). Looking 'design project-based group's is thus useful to construct a mechanism for this narrative strategy as analogy coming from the group members will show external and internal organizational issues relating to their design projects across inside and outside organisation structures (Yoo et al., 2006; Person et al., 2008; Ulrich & Eppinger, 2012). A pattern and mechanism will be identified through searching patterns in responses of participants (Pentland, 1999; this will be explained further in section 3.5 on thematic analysis).

Due to the aforementioned reasons, design project-based groups have been broadly used for empirical examinations in design researches as the representative bodies: for instance, relationships between organization design and forms of artefacts in architectural design practices (Yoo et al., 2006); design practices for new product design in organisational settings (Person et al., 2008) and cross-cultural

studies about different approaches to managing design between Scandinavian countries and the UK (Bruce & Docherty, 1993).

In this study, in order to access the appropriate extent of a sample group, **snowball sampling** was employed to contact the groups related to new product development projects. Although this is seemingly featured in a no framed sampling manner, a common interest with an interviewer and about a research topic can lead to the introduction of another interviewee (Bryman & Bell, 2011). This method was employed in the research on organizational and social issues for the in-depth interviews (ibid).

3.4.3.1.2. Sampling of different purposes for maximizing research outcomes

Samples were chosen differently in accordance with the two research phases (section 3.4.1.). This will maximise more rigorous analogy in this study as respondents' subjective statement can be triangulated through the process. This can also overcome the issues about limitations of qualitative research in terms of international and cross-cultural organisation studies: such as a limited number of respondents who can represent organisations, accessibility issues to learn overseas companies (physical distances), and confidentiality issues (confidential corporate design projects) (see also Bryman, 1995; Meho, 2006). By using different methods, data sources and different sampling domains across the two research phases, research outcomes will be validated and become robust.

In the pilot study, sampling was designed for testing and articulating the key conceptual framework developed from literature reviews with the semi-structured email interviews (To be specified in section 4.1.). In the main study phase, the sampling focused on in-depth expert interviews for one-to-one personal meetings, skype calls and emails in order to articulate and develop new reflections based on insights from the pilot study.

Interviewees were divided into two groups: external employees (global design and management consultants: pilot study 4; main study 11) and internal employees in consumer electronics and information technology companies (pilot study 7; main study 7) who work as consultants, engineers and designers (service, industrial, interaction designer and researcher, etc.) in design, research and development (R&D) and management areas.

All participants were selected from a group of NPD experts who had over seven years' project experience (ranging from 7 years to 30 years: on average 12 years) above senior level (pilot study: 11; main study: 18). This experience ranged from physical component design e.g. semi-conductor and product design projects to intangible content and service design in a global digital ecosystem within a range of large global corporations' projects, such as Samsung, LG (South Korea), Sony and Panasonic (Japan), HTC (Taiwan), Huawei, ZTE (China), Google and Dell (U.S.), Nokia (Finland), Philips (the Netherlands), BT (U.K.), etc.

Phases	Number	Method	Time
Pilot Study	**11** • External Employee group(global design and management consultants) : 4 • Internal employees in consumer electronics and information technology companies: 7	Semi-structured email interview	August 2013 - October 2013
Main Study	**18** •External Employee group (global design and management consultants) : 11 •Internal employees in consumer electronics and information technology companies: 7	One-to-one in-depth expert interviews (ranging from 40 to 120 minutes in length)	March 2014 - September 2014

- **All NPD experts with experience(on average 12 years' experience)**
- **Ranged from physical component design e.g. semi-conductor and product design projects to intangible content and service design**
- **Related to a global digital ecosystem within a range of large companies' projects in the East and West : Samsung, LG (South Korea), Sony and Panasonic (Japan), HTC (Taiwan), Huawei, ZTE (China), Google and Dell (U.S.), Nokia (Finland), Philips (the Netherlands), BT (U.K.), etc.**

Table 3.12 Sampling details (see also Appendices A.1. about the detailed profiles)

3.4.3.1.3. Development of Interview Questions

The multiple research phases of this study and the methods employed were not only aimed to collect data, but also to develop many **substantive research questions** that arise from existing theories and the realities of research domains as this research proceeded (Wallace & Wray, 2011). It can also provide construct validity for the best case study (Yin, 2002; note Table 3.8).

This can be also suitable for the chosen research methodology (i.e. case study) and reasoning approaches (i.e. abduction) as related to **hermeneutics** that focuses on the in-depth meaning of data in qualitative centric research (Myers, 2009; note also section 3.1.). The questions were developed by passing through multiple techniques applied to each research method: (1) **projective techniques** (**sentence completion task**) and **articulation of detailed analytical dimensions** for the email interview questionnaire in the pilot study. An **in-depth expert interview topic guide** that contained the most substantive questions for the main study was finally compiled.

Using these multiple phases to generate the substantive questions also provided benefits to this research's epistemological rigour as it was able to cover the criticism about intermediate epistemological positions between positivism and constructionism. This research is not fully established in the positivist's pure experimental design, so the multiple experiments with a questionnaire delivered to all prospective samples can be expected to have an effect of **'quasi-experimental design' that is used in the study of real organizations or social settings using pre and post-tests over time.** It cannot only reduce the risks of fully controlled experimental research

design and of naïve hypothesis that positivist researchers often make, but it also embraces constructionists' open-ended approaches (Easterby-Smith et al., 2012). The details of the process are as follows:

- **Projective technique (Sentence completion task):** Based on the literature review and the theoretical framework presented in the phase (section 2.5.) the pre-analytical dimensions for the analysis were developed and the initial questions came to be developed further. To articulate the questions and to apply them to the following phase (i.e. the pilot study) the questions were tested with a projective technique using the sentence completion task, which is an indirect technique relying on the spontaneity of interpretation of the respondents given sentences (Oppenheim, 1992). This can be suitable for best **hermeneutics** as a **pre-pilot study** as concerned with the following features (ibid):
  - **Association:** It assumes that people have a tendency to respond fast once they receive a stimulus word, which is called the 'say the first thing that comes into your mind' approach. It indicates that a picture or question to which they respond fast once receiving stimulus words will be less guarded and therefore more revealing of underlying attitudes and motives.
  - **Fantasy:** The respondents are assumed to guess, tell a story, or discuss a picture in imaginary terms and it offers an insight from deeper levels of their personality by using their own attitudes and experience.
  - **Ambiguous stimuli:** When respondents are asked to respond to some subjects with a relatively ambiguous stimulus, they reveal something about themselves when they respond with a certain amount of projection and interpretation.
  - **Conceptualizing:** Something about respondents' attitudes are assumed from how they name things, order things or group things, and also how they help researchers to name to what they responded, ordered, and grouped.

Based on this, the technique provides opportunities to extend the amount of data and insights in a given research frame as a purely exploratory way, as follows (Oppenheim, 1992):

- **Completing sentences beginning with varied ambiguous and subtler words in writing.** By doing so, it can help to yield unexpectedly varied results rather than stereotyped responses by means of indirect techniques.
- **The results in sentence completion techniques contribute to generating qualitative information** (Oppenheim, ibid. p.219) as well as objective scores by counting the frequency of responses with a little ingenuity.

These factors embrace qualitative and quantitative constituents for this research's rigour, by using the sense of evaluating qualitative methods and structuring data-gathering and analysis (Oppenheim, 1992, see also Charmaz, 1995; Corbin & Strauss, 1990).

In particular, the results of projective techniques help to articulate and provide subtle wording and unexpected qualitative information to the given questionnaire. The modified questions from the multiple pre-tests can help prospective respondents to access subtler meanings for intended responses. The following table 3.13 shows the following elements for constructing a questionnaire: detailed questions that were tested; the initial analytical dimensions (also see Section 2.3.4 on Hofstede(2010)'s research dimension & Section 2.5.1.3 on Adler & Borys(1996)'s types of formalization in product design); answers and comments used for wording in following phases.

Respondents' cultural background : German Speaker (2) , Chinese Speaker (1) , English Speaker (Irish)(1) , Korean Speaker (1) , Japanese Speaker (1)				
Initial planned analytical dimensions: what to ask		Questions provided	Answers to ( ) and comments	
		After reading below incomplete sentences, please, feel free to fill in the blanks with a word/words that you raise in your mind	1.how many words should be written in that come to your mind or is a better expression 2.to better describe a specific situation or circumstances that makes sense for respondents	
Power distance: small power distance vs. large power distance (Hofstede et al, 2010)	Relationship between subordinate and supervisors/ Perception to subordinate	1. In my organization, I am treated as ( ) by my supervisors(or my colleagues)	• wild card • equal • independent researcher • valued • a subordinate • being peripheral	passive expression makes ambiguous
	Decision core /Job performance core	2. In my organization, when making a critical decision, the decision making process is likely to be seen as ( )	• messy • participatory • key performance indicator • less important than the decision • a group work, but it ends through an individual, influential person who has positional power or not • consensual	what does critical mean for?
Uncertainty avoidance in an organization (Hofstede et al, 2010) : Level of formalization in a work process: enabling vs. coercive formalization (Adler & Borys,1996)	Repair: Authorisation characteristics Feedback characteristics	3. If my working procedure is authorised by my supervisors, the authorisation is seen as ( )	• top down • milestone of progression • validating • including positional power • taking the responsibility for the consequences by the supervisors	What does authorisation mean for this? What does procedures mean for?
		4. When I get feedback from my supervisors, the feedback is seen as ( )	• important • productive • source of driver • constructive • advice, guideline or discipline • part of performance appraisal	What does feedback mean in this?
	Internal transparency: Working procedures characteristics	5. My working procedures in my organization are seen as ( )	• informal • messy • record of progression • cross-functional • the first step prior to the final work • ?	Passive expression makes ambiguous What does procedures mean for?
	Global Transparency: Perceptions to individual specialty	6. In my organization, when carrying out job performance, my specialty that is related to the job is recognized as ( )	• important • appreciated • the source of evidence of being an expert in a specific field • improving outcomes • a tool or a way for our common goal • highly respected and appreciated	What does speciality mean for?
	Flexibility: Information openness/Information communication characteristics	7. When using information to carry out my job in my organization, the information is offered/provided by ( )	• external party • internal and external network • supervisors, library, internet, related organizations databases • research organizations • co- workers, and seniors • clerical staff	Spelling issues on' s' in British and 'z' in American what does information mean for?

	The meaning of deviation and breakdowns	8. If deviation happens during working, in my organization, the deviation implies ( )	• conversation • earning efforts • emergency of redirecting focus of study • refocusing of aims • barriers to the goals • problems to be avoided in the future	what does exactly 'deviation' mean; the definition of English (from most non-English speakers)
Collectivist vs. Individualist (Hofstede et al, 2010)	Underlying value on working (We vs. I): Meaning of human in organization	9. My successful ideas/works/job to be done will contribute to ( )	• planning • my own and the organization development • supervisors and myself • greater company success • both my organization and my career • improvement of my work performance, productivity or efficiency	
Masculine vs. Féminine (Hofstede et al, 2010)	Characteristics of Assertiveness vs. Modesty	10. In my organization, before presenting my opinion during work, I am concerned with ( )	• preparing presentation • their reaction • what my supervisors' view could be and how would they respond to it • ensuring that it is presented in a high quality manner • senior's response to it • nothing	
Duration to complete questionnaire			From 2min to 30 min.	

Table 3.13 The result of projective techniques

- **Developing detailed analytical dimensions and the questions for the pilot study:**
  Based on the results from the projective techniques, **detailed analytical dimensions** were developed **for the following research phases**. Through this, **questions** were articulated to be provided in the pilot study. It can be said as another **pre-test phase** to advance to the main study. Developing and articulating analytical dimensions can provide cohesion in this research, as drawing more substantive questions through a process of narrowing the emergent questions (see also Wallace & Wray, 2011). It therefore contributes to increasing the robustness of the questions that will be used for the email questionnaire followed by the in-depth interviews in the following phases. It is also helpful to expect technical issues such as the completion time of questionnaire or interviewing. The analytical dimensions, questions and expected deliverables of the questions are presented as follows (also see Section 2.2.3 on types of organizational inquiries & Section 2.5.4.3 on NPD principles that affect decision making) :

Analytical dimensions to be identified		Questions Developed	Reason for question
General Questions on New Product Development Project and Organizational Culture: Open issued questions		Do you know about global disputes regarding product design patents between Samsung, the South Korean firm and Apple, the US firm, which began in April, 2010?	• To confirm if a participant is included in the controlled sample • To clarify whether a participant can understand different organizational cultures, other than the one who he/she has worked for • To find out elements of generativity design practices in organizations • To clarify whether a participant can understand different organizational cultures • All those questions are intended to make participants recall relevant events or experiences
		Have you ever participated in an electronic product-related project?	
		Which companies have you worked for?	
		Which company are you working for?	
		Which types of products and/or product projects have you been involved in?	
		Is your organization using information technology systems to share your employees' knowledge and information generated from inside and/or outside your organization, relating to new product design projects? (e.g., IT systems provided by SAP, ORACLE, etc.,)	
		Have you experienced differences in organizational cultures among the organizations you have worked for?	
		Do you feel that the design of products can be influenced by certain organizational cultures?	• To collect additional information on ways that organizational cultures influence new product design
Approaches to managing design and the organizational inquiries in an organization : Whether or not it is a 'Holistic' or 'Reductive' approach (Mckelvey, 1982; Scott, 1998)		Have you ever experienced a product design project that is considered as an extension of a product system, which can be compatible with other products systems?	• To identify types of product design involved • To identify how it is aligned with types of organization structure, design and configuration affected by an organizational culture • All elements constituting the questions are constructed based existing theoretical discussions :e.g. Reductionist, Holist and Rationalist etc.,)
		Do you feel that the product design project just focused on building one product only, rather than considering compatibility with other products?	
		Do you feel that product design projects largely focus on current markets/situations, and are concerned with 'improving' or 'revising' functions or features, or any other physical aspects of existing products?	
		Do you feel that the product design project paid attention to a futuristic approach, with little consideration of currently existing markets and competitive products?	
Product Design Decisions in new product design process (Monö, 1997; Person, et al., 2008; Karjalainen, 2003)	Resources (Cost)	Is your budget always enough to accomplish your design project aims?	• To identify detailed and actual concerns in a reality of actual NPD process that involve the respondents in accordance with NPD mechanisms addressed in theories
		Do you feel that the product design project is particularly concerned with implementing the design with regard to their actual production lines in a factory, rather than the ideation of a new product design?	
	Time to market	Have your product design projects always been provided with enough time to come up with new design ideas?	
		Does the product design project concern itself with the product launch time, paying attention to the current market situation?	

	Product lines	Have you ever carried out a product design project taking into account diverse types of tangible product line extensions as detailed below? Please tick all included.	
Organizational cultures (Hofstede, et al., 2010; Hofstede, 1994)	Power distance	Does your company always treat you as a professional that specialises in special product design disciplines?	• To identify actual concerns that inhibit NPD processes • To identify which aspects of organizational cultures can affect actual design practices in accordance with Hofstede's four research dimensions (see the Table 2.1.1)
		Do you feel that your company treats you as a subordinate of the company, rather than as a professional?	
	Uncertainty avoidance	Have your company asked for different/diverse types of documentation while doing a product design project, in order to prepare for the unexpected/uncertain situations, although you thought that they were unnecessary?	
	Masculine vs. Feminine	Have you ever experienced limitations or difficulties when it comes to expressing new ideas or suggestions while exchanging/sharing ideas within your company?	
	Collectivism vs. Individualism	Do you think that your product design projects require a stronger degree of cooperation with your colleagues?	
Closing question		Which types of organizational cultures can be said to enable you to come up with new ideas for new product design?	• To collect additional information on specified organizational cultures for novel product design
		Lastly, in terms of 'Design', could you choose the most successful product among your company's products?	

Table 3.14 Questions Developed for Pilot study

- **Completion of interview guide for main study**

Despite loosely structured qualitative interviewing, an interview guide is necessary because this can help an interviewer to lead to the intended outcomes from interviewing with the constructed guideline (Bryman & Bell, 2011; Myers, 2009). For that reason, scholarly literature on qualitative research argues that there are rarely fully-unstructured interviews (Bryman & Bell, 2011; Easterby-Smith et al., 2012).

The process of constructing a qualitative interview guide accordingly helps a researcher to generate more substantive questions where there has been confusion, because this process has the researcher visit multiple discussions with literature and a pre-test process like grounded theory, as the research has done (Bryman and Bell, 2011). The final interview guide is therefore constructed by considering the following elements:

- Questions should be clear, comprehensible, relevant and short to participants, which can lead to detailed responses; and specific events or experience in asked questions could encourage respondents to deliver fuller narratives (Myers, 2009; Bryman & Bell, 2011).
- A few broad, open-ended and alterable questions are better than close-ended questions. For that reason creating a certain amount of order on the topic areas is useful for reasonable flow of interviewing (Myers, 2009; Bryman & Bell, 2011).
- Questions should be asked to lead specific intended responses (Bryman & Bell, 2011).

With an understanding of these issues, interview questions are further developed for the main study by narrowing down questions drawn from the results of the pilot study (this will be specified in detail in Chapter 4. Pilot study). The final interview guide was constructed in a certain order in accordance with the analytical dimensions that were established based on previous implications(Table 3.13 & 3.14) in alignment with the theoretical framework (also see Section 2.6).

Key Dimensions **(Drawn from implications of pilot study)**		**Question variations**
Open issued questions	Generic differences between Eastern and Western organizational cultures in design practices	• Do you find differences between Eastern based clients (organizations) and Western based clients (organizations) in terms of their priorities for design • If yes - please describe the type of situation/ project- i.e. the type of client, the brief, type of product and be more specific about the difference
	Generic elements that can affect decision-making processes in new product and service development	• What has been the most impressive design project you have worked on? • What was impressive about it? • What were the contributing factors to achieve success • Tell me about the project
Ideal digital platform strategy for new product and service design (adapted from Baldwin & Woodard, 2009; Ulrich & Eppinger, 2012) Whether or not it is a 'Holistic' or 'Reductive' approach to managing new digital product and service development		• Please describe a project that has been more incremental or derivative of existing market/ technology knowledge? • Why was it incremental or derivative? • What were the contributing factors of the particular type of project?
Information system: IT technology as an representative internal communication tool in NPD process (adapted from Boland, et al., 2007; Akgun, et al., 2006)		• I want to understand the difference between ways designers share knowledge & understanding on projects between clients. • Have you seen any difference between Eastern companies and Western companies in the way they share information with you during the NPD process? • What is in your opinion excellent communication with the design team? • What is poor communication? please give examples • How was the use of IT tools for sharing information with your clients for the design project? Are product design outcomes presented with computer representative (graphic, information) tools and shared with an IT system, or any other tools and methods for sharing? Is there any difference (between East and West)?
Attention structures(and conceptual brevity) in organization structure (Scott, 1998) : Factors that affect actual decision-making in new product development within an organization structure		
Digital platform strategy for new product and service (adapted from Gawer, 2009; Yoo et al, 2010)		• When it comes to current changing design environments – 3D printing, open source, open design etc., – What does product design provided by large organizations look like in electronics and telecommunication products? (How are large organizations addressing the changing design environment?); in order to explore the dilemma between openness and closed in platform strategy in the open design era • To what extent can the concept of product design be offered by large organizations for users/consumers? (e.g. should they offer all kinds of functions that customers want, or provide adequate functions for users to evolve it by themselves?) • What will be the role of each user and large organization for that future product design? • How should new product development projects be implemented to entail the future product design for those large organizations' projects? • What should future product platforms look like for really 'new' product/service designs? • And what should organizations (structure) look like for the ideal product platform and the strategy? • Could you tell me about the differences between your clients (East and West) in relation to performing platform strategy? (product development and technology roadmap) e.g. poor product platform strategy vs. the impressive

Enacted organizational cultures (adapted from Hofstede et al, 2010; Adler & Borys,1996)	• When you worked with large organizations (clients), what were the most difficult constraints to implement (address) a new design idea to new product design project that you incurred? • Is there any difference between Eastern and Western companies? • What should organization structure look like for an ideal product development project? • Have you ever felt that an organizational culture could affect an organization's structure, despite, seemingly, effective organizational structures in new product development projects? (for example, modular design or designer in house design dept.?) • What was the client organization's attitude in the impressive design project? (Who was it?) • Did they really deserve to take risks granted from the new design project (for really 'new' product)? • How did they collaborate with your company? • Could you tell me about the client's attitude in the most incremental/ derivative design project? (Who was it?) • Did they really deserve to take risks granted from the new design project? • How did they collaborate with your company? • What is your opinion of organizational hierarchies that work best for NPD?

Closing:
 	
Implicit organizational factors that can affect new product and service design in attention structure of an organization
	• Lastly, in relation to all the above, could you describe what the significant differences between nationalities (esp. East and West) in relation to design projects are?
	• In relation to nationalities and East and West…
	  ○ How about the importance of the conceptual ideation process for new design between nationalities?
	  ○ How about decision-making process between your clients?
	  ○ Then, what do the roles between engineering and design look like for really new products between nationalities?
	• In your personal experience, which type of organization would take advantage of designing 'really' new product in future, or disadvantage?

Summarising	• Summary: Summarise the conversation and what has been discussed throughout the interview • Is there anything else that you'd like to tell me about the above conversation? • Any questions? Would you mind introducing any acquaintances who may be related to this topic? (If an interviewee is friendly) • Thank and close

Table 3.15 Analytical dimensions developed and interview guide with the questions

3.4.3.2. Data collection for secondary data source

For the secondary data analysis in support of the qualitative survey data, whilst analysing the survey data sources (email interviews and in-depth interviews) the document and archival sources (all in electronic format) are securitized. They contain the corpus about selected cases (e.g. Apple, Google, Samsung, and Sony) and key phrases and words of the cases (e.g. manufacturing, hardware, software, revenues, etc.) relevant to the focus of the themes drawn (to be discussed further in section 3.5.). This partly considered in the method of content analysis that entails the quantification of themes: establishing the frequency of themes exhibited (key words and phrases) and how the variables are related to other variables (Easterby-Smith et al., 2012; Bryman, 1995). The central considerations of this phase are as follows:

- When implementing secondary data sources in relevant business management studies it has been useful to examine recent events relevant to the cases in qualitative and quantitative approaches

(Bryman, 1995). This study specifies the coverage of the events between 2007 and 2015 as in the year 2007 the first iPhone affected digital innovation and design principles of product and service were launched (see Chapter 1).

- In analysing secondary data, qualitative evidence in business and management periodicals were first scrutinized in order to cross-check interview data (see also Bryman, 1995 to understand examples of business periodicals). The data sources were mainly drawn from two data sources: the Economist (newspaper) and Harvard Business Review (journal articles). These data sources are reliable. The Economist has anonymous writers as third parties and the Harvard Business Review is situated between non-academic and academic journal articles; both sources focus on business, technology, design and innovation relevant issues, nationally.
- To search relevant data from business periodicals, electronic business databases were employed such as Business Source Premier (Harvard Business Review) and ProQuest (The Economist). Whilst analysing in-depth interview data and drawing the key themes, the corpus regarding key phrases and words regarding selected cases were studied. In addition to this, a set of data sources about relevant business cases (e.g. product design patent issues on Samsung vs. Apple, conflicts between digital platforms, Apple and Google and leadership issues such Sony etc.) were also studied from randomly selected data sources for reference: business case study books, biographies, and business reports and miscellaneous documents (this will be exhibited in section 5.3)
- In searching data in business periodicals, key phrases and words relevant to key themes were identified and input into the search engine. For instance, in the case of searching data on Samsung in the Economist, the relevant full text source search engine ProQuest was used, and the corpus containing ‘Samsung’ and ‘South Korea’ were searched first in the coverage of events between 2007 and 2015 (Total 111 results found). After initial screening, the full text based data were narrowed down by inputting more detailed keywords in accordance with the key themes drawn: inputting Samsung AND (South Korea) and (Revenue), the number of results reduced to 75 documents. In order to analyse the financial issues of the selected case, those 75 documents were screened and retrieved. In the same way, Business Source Premier was used to analyse the Harvard Business Review. The key words, ‘Samsung’ (AND; OR) ‘South Korea’ (AND; OR) ‘Design’ were searched and a total of 2 documents between 2007 and 2015 were identified and those were examined in support of qualitative data sources. All cases and the qualitative indicators were searched and examined in the same way by retrieving relevant key words during the analysis of qualitative data.
- In accordance with this, whilst investigating the qualitative sources including interview data, quantitative data sources in archival records regarding corporate financial information were also collated to demonstrate all those data sources. The data sources were selected from a variety of electronic documents exhibited on corporate websites (annual reports and earning reports in the

selected cases' websites, Apple, Google, Samsung and Sony); as well as varied business reports generated from research institutions offering market and corporate insights in order to cross check those sources (e.g. Reports from Martin Prosperity Institute; Cornell University, ISEAD, World Intellectual Property organization; The Global Entrepreneurship and Development Institute, IfM, MarketLine etc.). After the initial screening along with the identified corpus drawn from the qualitative data sources, the quantitative indicators identified were extracted from those sources, e.g. overhead cost in R&D management and then broken down into the elements constituting overhead cost and the flow of elements of overhead cost, revenues, operating profits and the rate extracted from those identified indicators (the details are to be presented in section 5.2.2.3.2 in the findings chapter). These were input into a spreadsheet for comparison, calculation and evaluation in the examination of the implications drawn from the qualitative data sources.

On this basis, the next section will explain how the main indicators from key data sources (i.e. in-depth interview data) were extracted as the key themes and key words; and how they were analysed for further elaboration.

3.5. Data analysis

3.5.1. Data analysis strategies for qualitative data: thematic analysis

Qualitative data analysis in real organizational context studies has an attractiveness due to its richness, but the analytical path for drawing findings is challenging because it is involved in eclectic, subjective and complex events with unstructured textual materials, rather than analysis of a interdependent relationship between *X* and *Y* variables (Langley, 1999). The analysis hence simply characterizes how collected data is described and explained, and how it is examined in practical ways, as it has not been fully codified as an analytical procedure (Gibbs, 2007; Bryman & Bell, 2011). Analysis of data thus implies different approaches dependent upon different contexts and actors. Gibbs (2007) described four different types of interpretation of data analysis: a **transformation process** from data collection into analytical procedures heading to original analysis. This process is involved in the sorting, retrieving, indexing and handing of qualitative data for generating analytical data; **a process focused on interpretation and retelling** for setting certain frames and moulding qualitative data; and a domain dealing with both **data-handling and interpretation**.

In this sense, scholarly literature has discussed three major strategies for approaching qualitative data across varied research subjects from business and management research to psychology: 1) **Analytic induction**; 2) **Grounded theory; and 3) Thematic analysis** (Bryman & Bell, 2011; Braun & Clarke, 2006)**.**

1) **Analytic induction**: a rough definition of a research question is a beginning, proceeding towards a hypothetical explanation of that question and continuing data collection. Depending on whether a case is inconsistent with the hypothesis or not, the hypothesis is redefined to exclude deviant cases or the hypothesis is reformulated through further data collection. Therefore, it shows rigour as to theoretical generalization. However, this method is often utilized to specify a single case as the final explanations with induction are constructed by discussing the conditions in which the phenomenon occur (Bryman & Bell, 2011; also note section 3.1.4; Table 3.3 about 'induction'). It rarely offers reliability to other cases in the same situation unless the hypothetical explanation is fully confirmed.
2) **Grounded theory:** Glaser and Strauss developed grounded theory in 1967. It is the most commonly used framework in qualitative data analysis. There are debates on its constructionism underpinnings (Bryman & Bell, 2011): i.e. data drives and generates theory with induction and deduction throughout, precisely and constantly articulating methods and presuppositions, so that it can be evaluated explicitly like quantitative methods (Corbin & Strauss, 1990; Glaser & Strauss, 1967; Easterby-Smith, et al., 2012). There is still controversy in the debate. One criticism is that it is too much focused on prescription and concept development (Glaser); vs. grounded theory as an analytic device towards theory development (Straussian) (Bryman & Bell, 2011; Easterby-Smith, et al., 2012). However, the theory contributes to the development of tools and outcomes for qualitative data analysis. **Tools** – ***theoretical sampling, coding, theoretical saturation, and constant comparison***, and **outcomes** – ***concepts*** referring to discrete phenomena produced through *coding*; **categories** – elaborated from *concepts*; **properties** – attributes or aspects of a category; **hypotheses** – relationships between concepts; and **theory** as a set of well-developed categories (Bryman & Bell, 2011).
3) **Thematic analysis:** this is the most common way of approaching qualitative data across all research disciplines (Bryman & Bell, 2011). It is simply defined as a method for **identifying, analysing** and reporting **patterns** (i.e. **themes**) within **data** (Braun & Clarke, 2006). However, it has occasionally been labelled as branded analysis due to insufficient literature (Bryman & Bell, 2011; Braun & Clarke, 2006; Aronson, 1995), because it is too generic to become a clustered and distinctive technique, and there is confusion between **themes** and **codes** for some researchers (Gibbs, 2007; Bryman & Bell, 2011). Hence, it has not been acknowledged as having an identifiable heritage in qualitative data analysis (Bryman & Bell, 2011).

However, all those debates are comprised into thematic analysis for this study. Against Bryman's concerns, Braun & Clarke (2006) advocate thematic analysis and define it as a useful and flexible method for all qualitative research approaches by providing outlines of a process of searching themes (or patterns), taking into account the epistemological and ontological position.

Thematic analysis is especially central as all data (qualitative and quantitative) are to some degree subjected to qualitative analysis for commonly recurring themes (Braun & Clarke, 2006). In other words, all data collected are to a certain extent involved in a process of identifying themes throughout coding, indexing, and categorizing towards drawing themes. The confusions between code and themes (Bryman & Bell, 2011) are also therefore the extent of noting the significance of drawing themes (Gibbs, 2007).

On the other hand, unlike analytical induction or theoretical saturation underlined strategies (Bryman & Bell, 2011), thematic analysis differs because it does not require theoretical and technological knowledge of the approaches (pre-existing theoretical framework) nor does it adhere to one theoretical framework (Bruce & Docherty, 1993). In this sense, thematic analysis is somehow posited in an intermediate stance between constructionist approaches (it can examine eclectic and complex issues: meanings, realities, and experiences with interviews or focus group surveys) and positivist stances (e.g. offering a certain report).

Since this research has used a design research paradigm based on pragmatism (note section 3.2), this intermediate epistemological stance can outline the approach of this study's data analysis. Furthermore, thematic analysis can create multiple level questions from research (Braun & Clarke, 2006,p 85). This **hermeneutical** method closely corresponds with the approaches of case study and mixed method (note sections 3.3; 3.4.2).

The next section will break down the steps of the thematic analysis and show the detailed approaches of data analysis in this study.

Data analysis strategies comprised in thematic analysis approaches		Remark
Inductive approaches • Themes identified are linked to the data themselves(similar to grounded theory): data driven • A process of coding the data without pre-existing coding frame, or analytic preconceptions	**Theoretical thematic analysis** • Tend to be driven by the researcher's theoretical or analytic interest and so characterized as more explicitly analyst driven • But, draw less description of the data and offer more detailed analysis	Available to code for a specific research question or research question can evolve through the coding process
Themes identified at latent level • Starts to identify or examine the underlying ideas, assumptions and conceptualizations and ideologies that are theorized as shaping or informing the semantic content of the data	**At semantic level** • The themes are identified within the explicit or surface meanings of the data and the analyst is not looking for anything beyond the written and spoken data • So, it is ideally progressed from description to interpretation	**For instance,** The latent approach: looking at a feature of an object which gives form and meaning The semantic: pursuing to describe a surface of an object, form and meaning
Constructionists (Relativist) view data analysis… • Meaning and experience are socially produced and reproduced, so that motivation or individual theories are not sought. Instead, it looks at theorizing the sociocultural contexts	**Positivists (Realist) view data analysis…** • Research motivations, experience, and meaning can be theorized in a straightforward way • A relationship between meaning, experience and language can be connected in a certain way, despite their simple and uni-directional relationship	However, both epistemological considerations are concerned with thematic analysis, and it can be reflected differently by what the research pursues and is interested in

Table 3.16 Thematic analysis in intermediate positions (adapted from Braun & Clarke, 2006)

3.5.2. Steps of Data analysis

In this study, the data collected was analysed in accordance with a procedure of thematic analysis outlined by Braun & Clarke (2006) (see also Aronson, 1995). All collected data in verbal and textual materials drawn from semi-structured emails and in-depth interviews were transcribed to search for features and to extract the themes that imply specific meanings and issues in the data. The phases are summarised as follows: **(1) familiarizing data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; and (6) producing the report:**

(1) Familiarizing data: The two research phases both started with transcribing data through to reading and re-reading the data in verbal (in-depth interview) and written formats (semi-structured email interview) in order to capture the initial **latent** meaning. Although it is a painstaking process, transcribing is central for all qualitative research as an interpretative act as it provides detailed meanings as well as re-readable text in order not to miss nuanced spoken contexts (Braun & Clarke, 2006; Gibbs, 2007). To do so, the data analysis for this study fully utilized a set of data packages consisting of the interviewer's diary (reflection of the interviewer's insight), summary notes and full transcribed data (section 3.4.4.4), because multiple records can be applied to the coding process in a consistent way (Gibbs, 2007). The

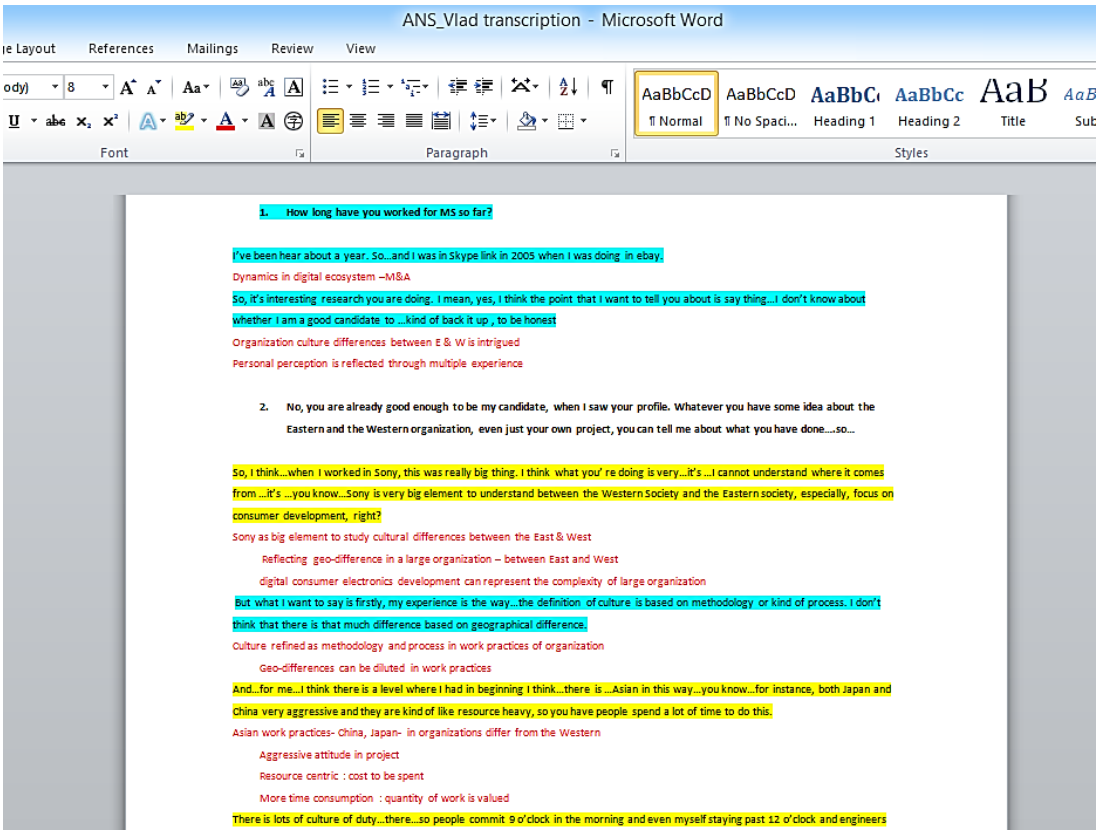
full transcribed version was produced through orthographic transcription of the participants' utterances (i.e. a verbatim account of all verbal and non-verbal) for best rigour (Braun & Clarke, 2006).

(2) **Generating initial codes:** Based on the familiarized data, this phase generated an initial list of ideas about what was in the data and what was interesting about them. It involved the production of initial codes from the data: **identifying the codes; matching them with data extracts that demonstrate the code, and ensuring that all actual data extracts are coded and collating them** together with each code. **Codes are functioned to identify a feature of the data** (i.e. semantic or latent) (Bruce & Docherty, 1993) and the name for the ideas identified from the data refers to the **code** (Gibbs, 2007). Codes are formed through **coding:** how a researcher defines what the data analysed are about (i.e. thinking about the text and its interpretation). It involves identifying and recording one or more passages of text or other data items and also to some extent exemplifies theoretical and descriptive ideas. Therefore, coding is simply defined as a way of indexing or categorizing the text to establish a framework of thematic ideas about it (ibid). Taking Strauss and Corbin's (1990) approaches, in general, coding has been divided into three stages in practice as follows (Bryman & Bell, 2011; Gibbs, 2007):

- **Open coding:** the process of breaking down, examining, comparing, conceptualising and categorizing data. The process thus yields concepts, groups the concepts and identifies categories.
- **Axial coding:** categories are refined, developed and related or interconnected. It is a set of procedures whereby data are put back together in new ways after open coding, by making connections between categories. This is done by linking codes to contexts, to consequences, to patterns of interaction, and to causes.
- **Selective coding:** a core category that integrates all other categories in the theory is identified. The procedure involves selecting the core category, systematically relating it to other categories, validating those relationships, and filling in categories, and filling in categories that need further refinement and development.

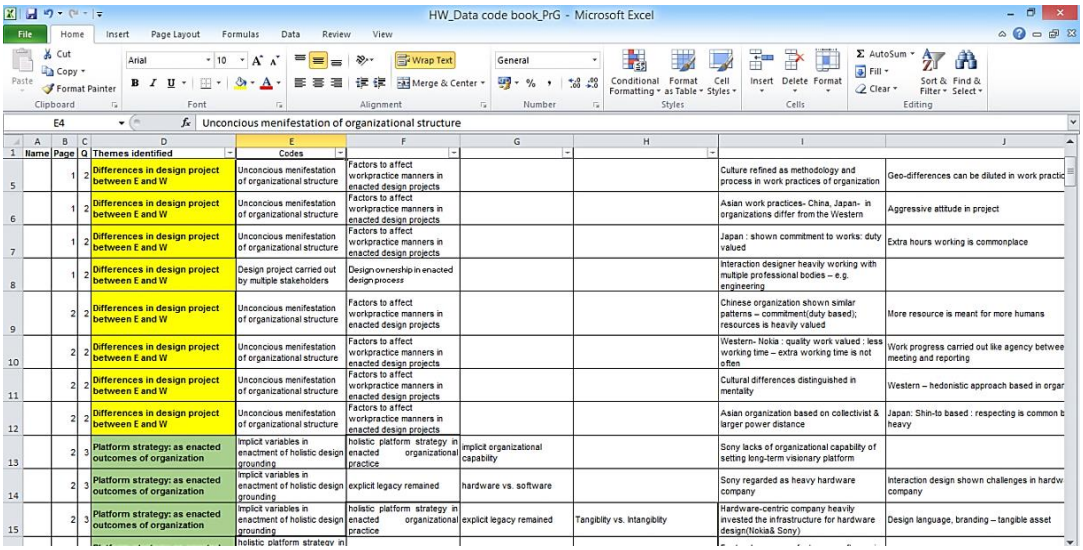
However, in **thematic analysis**, coding can be approached differently depending on whether the themes are data-driven or theory driven (Table 3.18), because **themes from data driven analysis rely more on the data itself, rather than the theoretical and technical attachment** (Braun & Clarke, 2006) (i.e. necessarily validating relationships between codes, filling in categories, and development in theoretical concerns (Bryman & Bell, 2011; Gibbs, 2007)). In this sense, this research choses the position in the intermediate stance because this

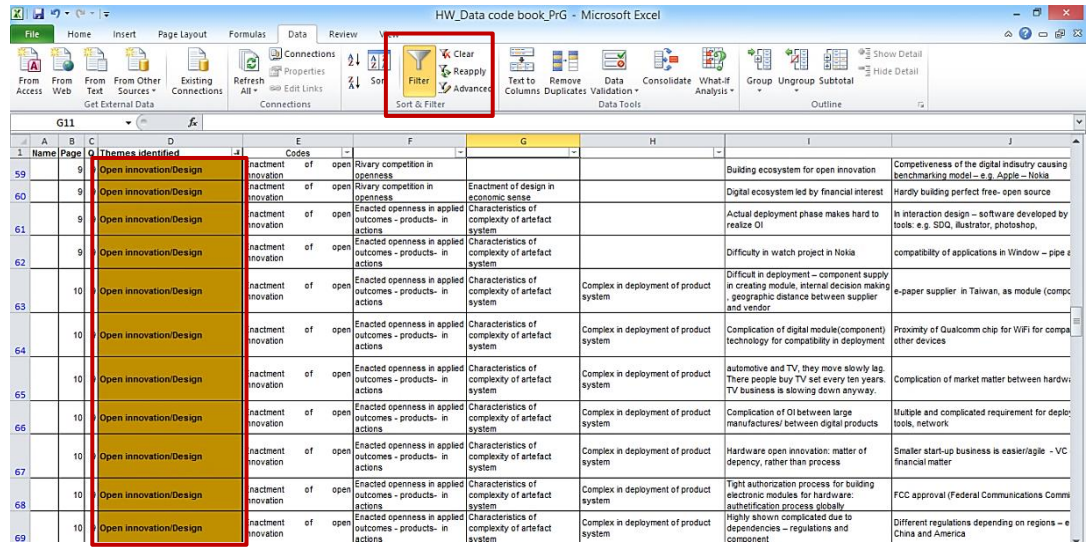
research's reasoning approaches are situated in **abductive** reasoning: i.e. the research began with prior theoretical knowledge, but it is deviating in real observation (note section 3.1.4; also Kovács & Spens, 2005). In this sense, coding is varyingly conducted across all types of factors that can be coded, including **behaviours, events, activities, strategies or practices, states, and meanings** with both **descriptive** (i.e. simply listing similar semantic content in texts) and **analytic types of codes** (i.e. taking account of latent meaning of descriptive texts and the contexts between codes) using **line-by-line coding** (examining each line of text to draw the best analytic codes) (Gibbs, 2007).



(3) **Searching for themes:** This step is related to collating codes into potential themes, gathering all data relevant to each potential theme (Braun & Clarke, 2006). This phase distinguishes thematic analysis from other analysis strategies such as grounded analysis and analytic induction. Such methods look specifically for detailed concepts, categories, and properties (Bryman & Bell, 2011), while this phase in thematic analysis is rather re-focused on the analysis at the broader level of themes, involving sorting and collating all relevant codes within identified themes. It is useful to use visual representation to effectively present the relationship between themes, as well as different levels of themes (Braun & Clarke, 2006). To do so, this study employed MS-Excel to effectively 'sort' and 'filter' to reconfigure the identified themes, aligning them with extracted codes because this process is continuing the iterative process of this phase. It is uncertain whether the themes identified are held, combined, refined and separated until the end of the analysis (ibid).

It is still controversial to use a specific computer aided qualitative data analysis software (CAQDAS), since the tools were neither universal nor fully functioned for coding (Bryman & Bell, 2011; Easterby-Smith, et al., 2012; Gibbs, 2007). For that reason, this study created and used own framework for the analysis within MS-Excel. The **filtering** functions were used to sort and reconfigure the themes.

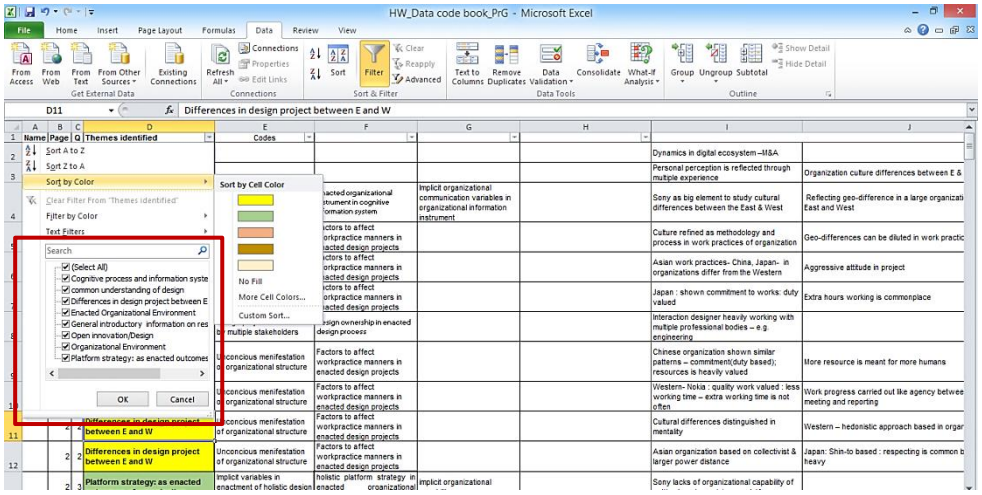


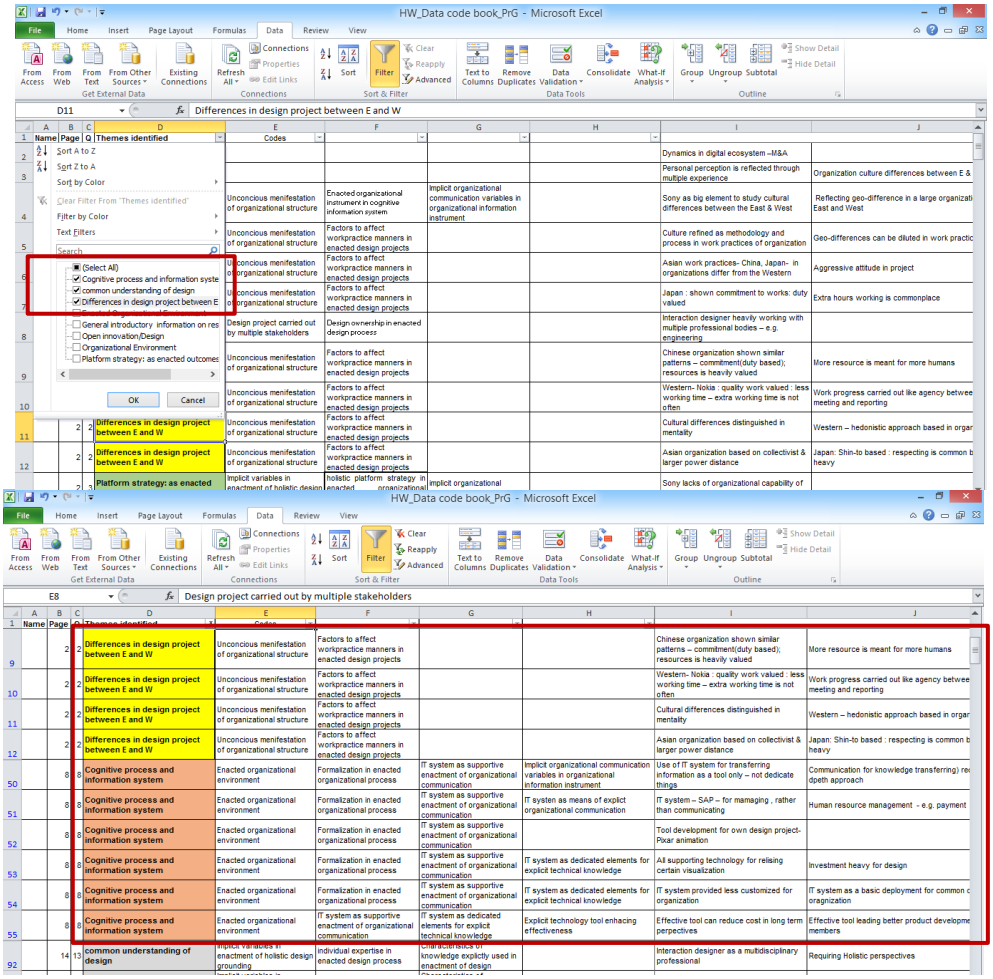


(4) Reviewing themes: it involves the refinement of themes identified to check if the themes work in relation to the coded extracts and the entire data set. By doing so, it generates a thematic 'map' of the analysis (Braun & Clarke, 2006). Since data within themes must be coherent and meaningful and able to be distinguished between the themes at the same time, this phase involved two levels of reviewing and refining the themes: revising at the level of the coded data extracts and reviewing entire data set. The aim was accurate presentation as well as identifying potential new themes (even starting new coding and re-coding them again) (ibid). This process corresponded with the constant comparison process of coding in grounded theory as the two representative schools of Glaser and Strauss suggested (Gibbs, 2007; Bryman, 1995). In this sense, thematic analysis can also embrace its own

hermeneutical approaches in qualitative centric research analysis. Filtering and re-sorting in this phase were repeatedly used to retrieve codes. It can refine them to draw new themes and review them.

(5) **Defining and naming themes:** ongoing analysis took place to refine the specific theme and the overall story that the analysis implies, generating clear definitions and names for each theme. The main purpose of this phase was to identify the essence of each theme and determine what aspects the data captures and to simplify the diverse and complex themes identified with detailed analysis whilst identifying the stories of the themes (Braun & Clarke, 2006). In doing so, hierarchies between subthemes and main themes are identified. By doing so, the themes are clearly defined (ibid). The process is similar to 'coding hierarchy', which arranges and gathers similar codes under the same branch of the hierarchy as applied in grounded theory analysis (e.g. considering whether to transform analytic code, descriptive codes, and categories, etc.) (Gibbs, 2007; Bryman & Bell, 2011). Yet, although there is confusion between the meaning and usage of those terms, both thematic analysis and grounded theory analysis are aimed at liability and consistency (either codes or themes) in the hierarchies through multiple processes of filtering (Gibbs, 2007; Braun & Clarke, 2006).
In this study the themes identified were continuously refined and renamed by reviewing the aligned codes through the process of filtering and resorting them as below.





(6) Producing the report: as the final analysis phase, this phase involved the selection of compelling extract examples and analysis of selected extracts by revising the research questions and literature. In doing so, a scholarly report of the analysis can be produced, such as a publication or a research assignment (Braun & Clarke, 2006). In this study, during the data analysis, three scholarly conference proceedings were published, in accordance with the designed research phases. This was also partly included in the design of the case study research process (section 3.3.;Yin, 2009): **Phase I** to **report exploratory insights** drawn from literature and the pilot study (Hwangbo, 2013; Hwangbo & Tsekleves, 2014); **Phase II: to clarify the extracts of major findings with multiple research deliverables** (Hwangbo, et al., 2015a; Hwangbo, et al., 2015b) in all authorised international conferences.

Through this actual write-up phase, this study can provide sufficient evidence not only of the themes identified, but also an accurate analytic narrative that can illustrate the story of the data collected in this research beyond simply a description of them (Braun & Clarke, 2006).

3.6. Chapter summary

This chapter has discussed the detailed approaches to the research design strategy behind establishing the research methodology. The discussion entailed significant philosophical considerations that should be considered in design and organizational culture study domains: pragmatism enveloping design epistemology. Based on this, the epistemological basis of the chosen research methodology, methods and approaches to data analysis could be justified.

The next chapter, Chapter 4, will present the major insights and further considerations that are drawn from the pilot study phase, which were collected through a series of semi-structured email interviews with design professionals (n=11). The analysis of the research phase will be utilised to develop further questions to be used for the in-depth interviews (n=18). The findings will be presented in the chapter on the analysis (Chapter 5). By doing so, the answers to the research questions will become closer by bringing out more substantive issues related to this research topic.

4. Pilot Study

4 Introduction

This chapter presents empirical data and the insights that are drawn from a pilot study as an exploratory study of this research. The pilot study was undertaken as the first stage of a case study approach (SEC. 3.3 & 3.4.1; Langrish, 1993). For an in-depth understanding of design practices - new product and service design - in organizational cultures in the East and West. This phase uses a qualitative approach based on the theoretical research framework developed from the literature review (note SEC.2.5).

This can construct robust epistemological ground for valid research, which is posited between positivism and constructionism (i.e. pragmatism). It can minimize criticisms against organizational culture studies that have been undertaken with rather positivist approaches: e.g. criticisms of the quantitative survey based on Hofstede's organizational culture studies with little in-depth consideration of members' psychological aspects in actual organizations (Spector et al., 2001; Easterby-Smith et al., 2012).

The empirical data collected in this phase shows actual concerns about carrying out this research. This helps develop the profound insights regarding a relationship between organizational cultures and actual design practices - new product and service design for digital technology-embedded artefacts. Also, this will lead to developing substantive questions that are to be applied to the main study phase. It can be also useful to construct validity by applying multiple methods and cases within this study (see also Table 3.8). The chapter is therefore composed of following sections:

- **Pilot study setting (Section. 4.1.)**
- **Insights and reflection (Section. 4.2.)**
  - **Design-Centered Organization and underlining risks and uncertainty reflected in information transferring (Section 4.2.1.)**
  - **Concerns of Actual Decision-Making in the reality of NPD (Section 4.2.2.)**
  - **Different strategic decisions affected by organizational cultures in the East and West (Section 4.2.3.)**
- **Recommendation (Section. 4.3.)**

4.1. Pilot study setting

At this stage, an online-based email interview was chosen to cover sensitive organizational issues and distance issues for better cross-cultural study, as part of the survey research method (Meho, 2006;

note 3.4.2.2.). The data was collected from project-based organizations specializing in NPD. A design project-based organization can be used as a research domain in design studies: organizational design in architecture design (e.g. Yoo, et al., 2006) and design consultancies in cross-cultural study (Bruce & Docherty, 1993), because it has multiple interactions with different types of communities both inside and outside the organization.

The questionnaire was developed based on the proposed theoretical research framework with open-ended and semi-structured questions. As presented in section 3.4.3.2, nineteen email interviews including Skype calls were conducted with twelve interviewees between Sep 2012 and Oct 2013 from two design professional groups to maximize analogical approaches (Yin, 2004; Loewenstein, et al., 1999): (1) a set of design professionals who work at large global consumer electronics or telecommunication companies (n=7) in NPD fields: Engineering Design, Industrial Design, Marketing, and Design Research, working at South Korea, Japan, USA and Singapore-based consumer electronics and telecommunication companies ; (2) a set of product design consultants (n=5) specialized in Innovation strategy, Service Design, Engineering Design, Design, Marketing, and Sales, who have worked for Eastern-based clients and Western ones in the UK, the USA, and Singapore were selected. All respondents are of a senior level in their organizations: client group (avg. over 5 years' experience); design consultancy group (avg. over 18 years). Through the interviews, common cases that respondents noted were selected (Table 4.1.). This will be useful to elaborate a range of cases that will be studied in following research.

	Year of founding	**Country**	**Total Employees**	**Sales (£ M) 1-Year Sales** **1-Year Sales Growth**	**Net Income** **1-Year Net Income Growth**	**Industry (Primary Industry)**
A	1969	South Korea	90,700	£116,509.17 M (in 2012) 32.43%	£13,432.42M (in 2012) 83.42%	Consumer electronics (Memory Chip & Module Manufacturing)
B	1997	China	78,402	£7,463.72M (in 2013) (7.68%)	£134.69M (in 2013) -	Telecommunication (Wireless Telecommunications Equipment)
C	1935	Japan	293,742	£50,946.59M (in 2013) (18.74%)	£5,261.70M (in 2013) -	Consumer Electronics Manufacturing
D	1962	USA	-	- (3%)	- -	Personal Computer Manufacturing

Table 4.1 Selected Cases Profile (hoovers, 2014)

4.2. Insights and reflection

4.2.1. Design-Centered Organization: Matters of Risk OR Uncertainty management

Elements of design-centered organizations

The major insights from this phase address elements of **'design-centered organization'** first, and the factors contrast actual NPD processes to underline significances in NPD processes in large organizations. This study in this phase found that an organization for *designing* is concerned about emergent risks or uncertainties, and the attitudes are differently reflected. Because an organization has to embrace failure and the attitudes are likely driven by less- hierarchical organizational structures, rather than a traditional single-hierarchical structure as stated below.

> **The design of a product / interface / system is a reflection of how the company perceives their customers… any user who looks / feels / talks to them knows instinctively how much they matter to a company. Therefore the culture is reflected in the output.**
>
> **[GF]**
>
> **To design is to decide, design projects are a mirror of the decision taking culture in any organization.**
>
> **[EG]**

By doing so, this organization can help an individual member's new idea implement a new solution, and the organization can quickly respond to the risks with new and multiple solutions - organizational agility in response to the dynamics of market (Figure 4.1.). Thus, *designing* in organization can be inferred to as organizational attitudes towards risk-taking and it can lead to different types of organizational cultures resulting in different organizational structures in *designing.*

> **Organizational cultures should take new challenges and risking-taking by balancing them with stability and those aspects impacting on coming up with new design.**
>
> **[JH]**
>
> **Depending on industry and culture, the exchanging ideas and brainstorming of concepts can be limited or maximized. For example, if the industry is not fast enough or competitive in the market, the company tends to stay within its comfort zone. Employees don't want to be challenged to develop a new product. Culture-wise, juniors can freely express their opinions in organization, which has a flat structure. On the other hand, organization with a hierarchy would limit the expressing of employees' opinions.**
>
> **[YR]**
>
> **Better, faster, more open communication in the organization brings a bigger flow of information which drastically enriches the set of ingredients for the design. Also the culture that encourages/motivates everyone to contribute…**
>
> **[JJ]**
>
> **There are always multiple solutions to one product design. The design chosen would be a result of the organization's risk level, their response speed, and capabilities.**
>
> **[JW]**
>
> **Whether the organization is used to an "open" culture or not strongly affects the innovative designs. "Closed" culture organization tends to only care about its own category and is not keen to share any info and ends up cannibalizing. Also, an organization with a strong hierarchy with many levels of approval is less likely to create something really innovative as it takes too long and those in management are in most cases old and less likely to accept new ideas.**
>
> **[MG]**

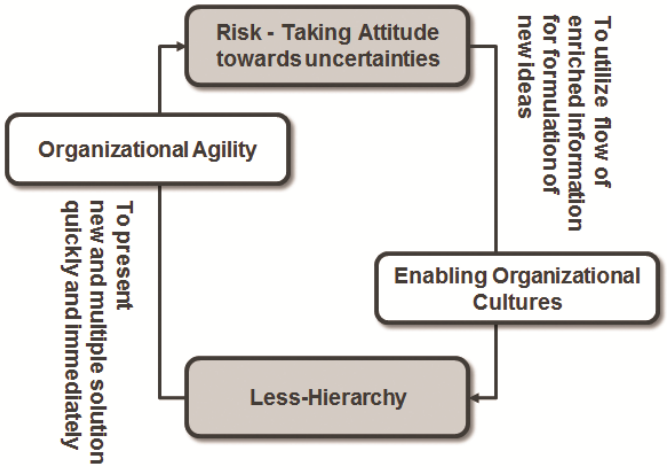


Figure 4.1 Elements of Design-Centred Organization

Differences in risk and uncertainty in attitudes reflected in information transferring

The different organizational attitudes towards risks and uncertainties are reflected in the characteristics of a tangible organizational system: IT infrastructure, which incremental anxiety and risks are underlined by confidentiality issues: (1) inflexibility of the IT infra sharing system due to issues of confidentiality; and the confidentiality causing (2) another formalization for precise decision-making. Although IT infrastructures are generally employed across functional groups in NPD process with such as ClearCase, SAP or ORACLE, Siemens NX for managing and coordinating a wide range of information emerged from inside and outside organizations, IT system are seen as inflexibility.

> **My company provides its own version of an intra info-sharing system which is not really flexible enough to be used for sharing various types info/data across the countries. After all, on a team level, we came up with the idea of using Google as an 'unofficial' central sharing gateway, which has been working well so far. This is NOT recommended by the company for reasons of confidentiality but we all know this is far more flexible than whatever we have and every team member has high-level integrity so no problem at all so far…**
>
> **[JJ]**

Accordingly, the confidentiality issues tend to cause diverse formalization in some organizations during NPD projects: respecting senior and experienced personnel's opinions, documentation, personal contacts and presentation, rather than use of IT infrastructure.

> **These knowledge and information is normally kept within the department as it's very confidential. When necessary people make face to face presentations to other department.**
>
> **[JW]**
>
> **Knowledge is shared through personnel (experienced designers/engineers/marketers) and documentation (specification documentations, presentation, excels).**
>
> **[MG]**

The inference from this section is that in actual NPD processes, organization is often laid in incremental uncertainty of development projects and sensitive risks, and this could determine varied formalized formats within an organization. These actual concerns lead us to come up with the following substantive questions regarding organizational attitudes towards tolerance of uncertainty and risks:

- **How is information exchanged amongst design participants and organizations in new product development projects? And what is the most challenging part of transferring the information?**
- **Do IT tools affect sensitive organizations' issues – e.g. confidentiality, client organization's process, structure and culture - when a new design idea is addressed?**
- **How can sensitive organizational issues be overcome in transferring information and ideas with clients?**

4.2.2. Concerns of Actual Decision-Making in reality of NPD

As noted in the previous section, in the actual decision making of the NPD process, organizations likely concern about incremental risks that emerge from manufacturing and managerial issues is related to *budget control*. This is explicitly seen as a significant decision-making attitude; *tighter time scheduling for ideation; controlling a wide range of product variation for market achievement*, under *hierarchy of organization* affected by organizational culture. The major insights on the dimension of actual decision making in a real NPD process are as follows:

- Firstly, all inputs of resources in NPD are associated with the reality of managerial issues on **manufacturing and complicated production lines**; **expansion of production lines followed by managerial issues; reducing costs in order to maximize profits.**

> **Most companies will have to compromise on constraints on the production line since that is the most economical solution. More design led companies may be willing to invest in inventing a new production line process; this doesn't happen often. Production line reality makes design tougher, but it shouldn't affect design that much when the designer knows how to influence manufacturing or when design is strong enough within a company.**
>
> **[YR]**
>
> **The problem is the separation between advanced product design development and actual design implementation for commercialisation. These 2 steps are often carried out by different designers so a lot of core design concepts are lost when it comes to production line as the 2nd part designers are more restricted by production restrictions and also are not as passionate about the original concept.**
>
> **[MG]**

- Next, NPD processes in a large organization are often carried out in '**tighter time scheduling'** in response to competitive market situations. Thus, sufficient ideation time for new design idea is not

easily allowed, so general projects tend to pay attention to current market situations.

> **Product design is not art; it is about making money in the end so we also work within a given schedule which is dependent on market situation.**
>
> **[YR]**
>
> **[The design project] Forecast 2-3 years in the future, based on the current market situation.**
>
> **[MG]**

- Thirdly, in order to chase a market situation **a wide range of product line extensions**, based on existing product lines, is broadly utilized in NPD processes in consumer electronics and telecommunication; often for a wide range of 'targeted' consumer segmentations with minor changes or revisions of physical aspects of product design. Or it should already be considered due to the nature of a product itself – e.g. consideration of scalability and expandability in software systems and the nature of electronic product systems.

> **Functions [line extension] due to marketing sell up strategy, Colour [line extension] to differentiate functional differences or market, Size [line extension] to capture different user segmentation, and Pattern [line extension] to offer customization during special promotion/event…**
>
> **[YR]**
>
> **A project is asked to make minor changes of an original form of UX design in order to respond to the needs of the local market or of local distributors**
>
> **[TY]**
>
> **Software/service design planning may include a plan for the scalability and expandability for the subsequent phases.**
>
> **[JJ]**

Taken all together regarding the actual concerns about decision-making in the NPD process following substantive questions were drawn up:

- **Which aspect of new product development is significantly addressed amongst design participants (i.e. participating organizations) in the NPD process: such as cost, time schedule, new ideas, or a type of project?**
- **Which is an element that a design participant underlines in an early phase of new product development process, how does it differ between design participants (i.e. participating organizations)?**

4.2.3. Different strategic decisions affected by organizational cultures in the East and West

This phase revealed that different strategic decision-making processes in NPD could be affected by the shape of the organizational hierarchy. This is likely influenced by the organizational cultures. In particular, the differences are seen distinctly in the Eastern-based organization where stronger

bureaucratic hierarchy resides as compared with Western ones. The Eastern organization's features in decision making are characterized as **Top-down hierarchy; Collective decision-making; Engineering mind-set; and Execution.** The details are as following:

- Firstly, Eastern Asia-based organizations show a tendency to rely on top-down and collective decision-making in design projects, and so decisions made by their boss and other members' agreement is one-way process.

> **Asian companies have very strong 'top down' cultures mixed with excessive respect for hierarchy and consensus. This often gets in the way of progress.**
>
> **[EG]**
>
> **The biggest difference is decision making - in the UK & USA it is often the HIPPO - highest paid persons opinion…. in Asian companies it is more collective decision, then the boss says yes!**
>
> **[GF]**

- Next, Eastern organizations tend to pay attention to tangible execution for engineering, rather than intangible conceptual ideation.

> **Generally western companies are happy to buy into an idea early on and make a selection based on the idea/concept rather than the execution. Asian clients have difficulty with this and often confuse the idea with the execution.**
>
> **[MT]**
>
> **Broadly, Asian companies are more engineering led (their history) - although this is also true for many of our western clients.**
>
> **[GF]**

Those tendencies can be clearly examined in actual organizational attitudes reflected in the NPD process in large Eastern Asian companies. Eastern Asian based organizations may be much underlined in the vertical hierarchy of organization causing avoidance of risk-taking & obsession with precision, one-way communication and collective particularism during design project. The detailed insights about the distinctive patterns in the Eastern based organizations are as follows:

- Firstly, different perceptions to designers' level were illustrated and there were much intrinsic vertical hierarchy in those organizations. Respondents working at a South Korean - based 'A' company and Japanese - based 'C' describes as 'subordinates' characterized as 'the disposable' and 'belongings' of an organization, rather than design professionals.

Japanese companies tend to think it's natural that all employees should devote themselves to the company for the whole life.

[MG]

[The interviewee feels like] simple supplies which can be thrown away once being out of order after use

[JH]

- Next, attitudes towards documentation are another reflection regarding a different degree of tolerance of uncertainty or risk, or whether an organization obsesses with precision under controlling (see Hofstede et al., 2010, p. 315). In the study, documentation is a necessity/ fundamental/ requirement, due to the nature of unprecedented design projects that need to be kept up with precision in an NPD project; whereas documentation is seen as an unnecessary or routine task. Although in an NPD process documentation is aimed at scientific verification tools in work practices during complicated design projects, the verification is sometimes seen as an obsession with precision, leading to unnecessary documentation for every uncertain situation in Asian companies.

Often, we have to generate numerous versions of documentation although the contents are almost identical among them, such as a version for the engineer, a version for reporting to supervisors, a version for sharing with other groups, and a version to be sent to the client.

[JH]

User experience recommendations can often be based on expert reviews, which seem unscientific to the company, so they may ask for reports, proof, or assurance that our recommendations are sound.

[JW]

A Japanese company once asked us to deliver 2D 'pictures' of our 3D data because their process did not allow for ID in 3D.

[EG]

- Thirdly, **one-communication way** attitude overwhelmingly compels in NPD process in the Eastern Asian organization and this can affect for design professional members to present new ideas within their group. It is found that there is tighter supervision - **evaluation of new ideas, tighter time scheduling in ideation - and the senior level's closed mindset affected by their engineering influenced background**, which restrain the presentation of new ideas, causing viable, tangible and precise decisions:

The organizational culture to emphasise time schedule [to launch product]

[JH]

It's always difficult to communicate a new idea to anybody else because it's a NEW idea which requires some time for people to digest. The difference is, some companies are more open to 'listening'. Some don't.

[JJ]

Design is a new field to many companies in Singapore [...] Companies are typically stronger in engineering or marketing.

[JW]

The language barrier is actually huge. Also if the design HQ is not very open-minded they do not trust "European" trends or mind-sets and tend to make a decision based on their own Japanese mind-set.

[MG]

- Lastly, the cooperation characteristics could be also affected by the different degrees of hierarchy in the NPD process**: collective particularism in organization** in the East Asian organizations. In general, cooperation for new product design is necessary for open-collaboration across all project participants: design, software, hardware, marketing, planning, verification etc., with a set of constructive feedbacks as stated below:

Design is always about cooperation. How easy/hard the product is to do depensd a lot on the persons working on the project. For example, if we have good cooperation, engineering understands and takes our suggestion, investigating possible technical solutions, we work with marketing in order to know the market response as well.

[YR]

[Design projects] Always need lots of people's understanding and [an organization] making those key personnel feel that they're a part of the project is very important to proceed with the project.

[MG]

However, limited resources and tighter time scheduling and supervision in Asian organizations could cause collective particularism between relevant groups and it resists coming up with new ideas for new product design.

[Design project is] necessarily requires collaboration/ cooperation based on negotiation and discourse because it requires the distribution of limited resources [to carry out a design project]

[JH]

In order to achieve inspiring concept of design group, it is important that the design project is carried out in cooperation with different types of relevant functional groups as well as the inside of a design group, such as software, hardware, marketing, planning, a verification group and so on [...] Each group has its own projects and should cope with the jobs that were already given. So, a new project causing extra work for them is resisted intentionally.

[TY]

It all presumably implies that in Eastern Asian organizations' higher degree of hierarchy - top-down and collective decision-making - could be reflected in higher expectations about viability, feasibility and stronger precision-centered solutions with an engineering-based mind-set. And also it could cause the tendency to avoid criticism from the senior level or other members, and so it can cause concentration on viable execution with inflexible or tighter formalization activities for precise decision-making, rather than conceptual and new ideas implying incremental ambiguities and ill-defined progression. Based on the above implications, the following substantive questions are drawn:

- **In relation to electronics and the telecommunication product development process, what would be the most challenging part in NPD projects?**
- **How could this challenging point affect shifted design rules (i.e. designing)?**
- **How should the organizational structure look for the ideal product development process in the electronics and telecommunication industries?**
- **Could an organizational culture intrinsically affect the organizational structure of new product development processes?**

4.2.4. The possibility of different approaches to platform strategy

This phase comes closer to the assumption that different organizational attitudes in strategic and cultural respects can be reflected in an organization's platform strategy, and so it can be said as the whole of the design outcome of an organization (note section 2.4.5 in chapter 2).

Despite organizational efforts to design new products, there could be different approaches to overall product systems depending on how an organization looks at future markets where incremental uncertainties reside in NPD processes and this could cause different approaches depending upon organizational cultures.

The distinguishable tendencies were revealed in a platform strategy at an earlier stage of NPD process especially in the East, as compared with the Western ones. From the NPD projects of selected Eastern-based organizations, there are major differences in approaches to product platforms in organizations in two respects, in terms of types of compatibility with heterogeneous products: ***(1) compatibility with homogeneous products among relevant tangible products; (2) compatibility of products entailing the heterogeneous across tangible and intangible product.*** This study hypothesized that those features can stand for whether an organization views the future market in a holistic perspective at an earlier phase.

- Firstly, with regard to ***compatibility with homogeneous products among relevant tangible products,*** although all organizations make efforts to approach futuristic and new products during NPD projects the approaches to product systems differ considerably in Eastern Asian Organizations and show tendencies to focus on visible and tangible outcomes with existing assets. This is stated in a comment about one growing Chinese telecommunication companies,

B' design strategy (see Table 4.1.):

We were asked to define a European design strategy - to help them compete with global brands and to strengthen their relationship with European networks. The strategy required an expression of their brand, defined by them, but that was driven more by comparison with others, not as a route to provide clear differentiation. (Feature phone, smartphone, tablet & others).

[GF]

However, regardless of market competitiveness and maturity (note corporate net incomes and histories in Table 4.1.1.), these tendencies are also found in design projects across product platforms in one successful South Korean-based company: the 'A' company. Although they attempt to look at future focused products (e.g., 5-10 years out) the actual NPD process employed for the approaches to future products were limited, focusing solely on existing and tangible products as stated below:

Consumer electronics company, Korea. Sometimes projects are future focused (5-10 years out) and whilst we considered current markets we are often designing in a landscape without competition.

[MT]

In case of semi-conductor chip design the product is characterised as the one that is required to take from one and a half to two years even after completing the design, to arrive with general consumers. Thus, the prediction of two years after the market is the significant point. The AP (Application Processor) chip* equipped in a mobile phone is included in this type of the product.

[JH]

I have participated in the project, the contents of which are easily shared amongst different types of (existing) devices.

[TY]

***see footnote 2 in page 156**

For instance, in the component level of the NPD process – Application Processor (AP) chip[2] design projects at 'A' company were undertaken for the extension of the product system within relevant products – mobile devices - with a two year out future prediction. In User Experience (UX) design level at the A company, the projects were also undertaken for sharing contents between those 'mobile devices'. But the mobile devices refer to 'physical devices' only in layered modular architecture (see Yoo, et al., 2010, p. 727). New product development projects at the 'A' company may be thus focused on a homogenous physical

[2] **Application processor (AP)** is a technical term that is often used by telecommunication and network companies. It refers to a system on a chip (SoC) designed to support applications running in a mobile operating system environment. It provides a self-contained operating environment that delivers all system capabilities needed to support a device's applications, including memory management, graphics processing and multimedia decoding. A wide variety of mobile devices contain AP chips, including feature phones, smartphones, tablets, eReaders, netbooks, automotive navigation devices and gaming consoles. Most mobile application processors are supplied by global semiconductor companies or large electronics companies, which are **ARM (UK)** platform-based vendors including **Qualcomm, Broadcom, Apple, Marvell, (US), Samsung (South Korea), and MediaTek (Taiwan)** (InfoWorld, 1998; Scansen, 2013; Miller, 2014).

device level, from components to UX design. On the other hand, a respondent working as UX designer in 'D' company in the USA-based computer electronics manufacturer, to which the AP chips are supplied by the 'A' company, stated that building an ecosystem for the integration of service and product solutions has been undertaken, which are heterogeneous types of artefacts.

- Next, in relation to the aspects of the ***compatibility of products entailing the heterogeneous across tangible and intangible product,*** this can be exemplified by looking at how organization views service software placed in the physical products, which are **heterogeneous** relations between intangible and physical artefacts. Building a digital product platform with service software should be well aligned with other complicated heterogeneous platforms supported by the capability of the physical devices (see Yoo, et al., 2010). However, despite the noticeable achievement of the 'A' company in the market, the holistic approach across the product system is not easy without supporting organizational grounding - e.g. leadership and history. This is stated by one respondent who has experienced the company as follows:

> **As I understood, the question might aim to identify how an organization pursues each product innovation by building an ecosystem, based on a long-term road map established by the organization… However, in the case of Korea (where the interviewee has worked), the country may be regarded as a follower of the software [ecosystem] industry. It is certainly true that building a platform has been little considered in the past… For instance, one Korean company [the interviewer suggested] had perhaps had particular reasons why they had done it like this [hardware-focused ecosystem] as they might also significantly consider the roadmap as well as building ecosystem by their efforts. But designing software [ecosystem] might not be easy… To do so [product innovation in long term and consistent roadmap], the visionary leader as well as the grounding is necessarily required in my opinion…**
>
> **[JJ]**

Overall, we can draw the following substitutive questions to be asked further. Different organizational cultures resulting in different structures of organization can even affect the whole product system that can be determined by the overall ecosystem; because of different strategic decisions on 'open' for 'heterogeneous' and 'closed' for 'homogeneous' (Figure 4.2).

Eastern Asian organizational cultures in consumer electronics and telecommunication sectors could have efficiently optimized more tangible and viable execution for better hardware design, based on existing engineering, manufacturing and market-focused strategy. And it could lead to the development of a product platform for homogeneous products – **precise engineered-hardware products.** It could be possibly related to the more tightly controlled management style in the Eastern Asian organizational culture. The tightness can however be seen as a stronger controlling force in organization and product design, due to the nature of the complicated modular and layered digital product and the open ecosystem where incremental ambiguities reside. The detailed questions are as following:

- **In future, regarding changing design environments (e.g. 3D printing, open source, open design etc.), what kind of product should be addressed for consumers in the electronics and telecommunication market?**
- **To what extent can the concept of product be offered by large organizations for use?**
- **How should the product platform be performed for product design?**
- **How should an NPD project embrace the shifting design rules in large organizations?**

To sum up this pilot study, the major inferences of this phase are that approaches to new product design can differ nationally in large organizational cultures, due to the influence of national cultures. This can affect the shape of different hierarchies of organizational structures that have an impact on new product development processes. The major differences between the East and West are therefore encapsulated as **Top-down vs. Less-Hierarchy; Collective decision making vs. Pragmatic Decision and it can lead to different organizational cultures: Engineering mind-set and Execution driven vs. Conceptual ideation driven.** The details are as following:

- First, unlike Western organizations Eastern organizations may rely greatly on top-down and collective decision-making even in design projects that develop future markets with compatible and expandable product systems. In Eastern Asian organizations collective decisions made by their boss and their groups are placed in new product development processes, while in Western organizations it is said that pragmatic decisions are made by the highest paid person's opinion.
- Next, Eastern organizations tend to pay attention to tangible execution and are characterised as more engineering-centric mind-sets. In contrast, western companies rather celebrate approaching conceptual ideation at early stages of the development process. For instance, Far Eastern Asian organizations such as Korea, China Hong Kong and China are sometimes confused by conceptual ideas that design consultants proposed with the execution at the earlier stage.
- All of the above can lead us to a hypothesis that Eastern Asian organizations' characteristics (i.e. higher degree of hierarchy; top-down; and collective decision-making) could be associated with stronger precision-centred solutions. This causes an engineering-based mind-set. Accordingly, stronger hierarchical organizational cultures in Eastern Asian organizations may cause avoidance of criticism from top level or other members, and it could lead to engineering-led mind-set that emphasises viable execution based on precise decision-making, rather than conceptual ideas implying incremental ambiguities and ill-defined progression.

Those assumptions drawn from this phase come up with the following questions by encapsulating prior questions:

- **Are there any differences in approaching to managing design between Eastern organizations and Western organizations in new product development projects?**
- **How can the cultural differences of organizations in the East and West take advantage of shifted design rules and meanings (i.e. designing) in their NPD projects?**

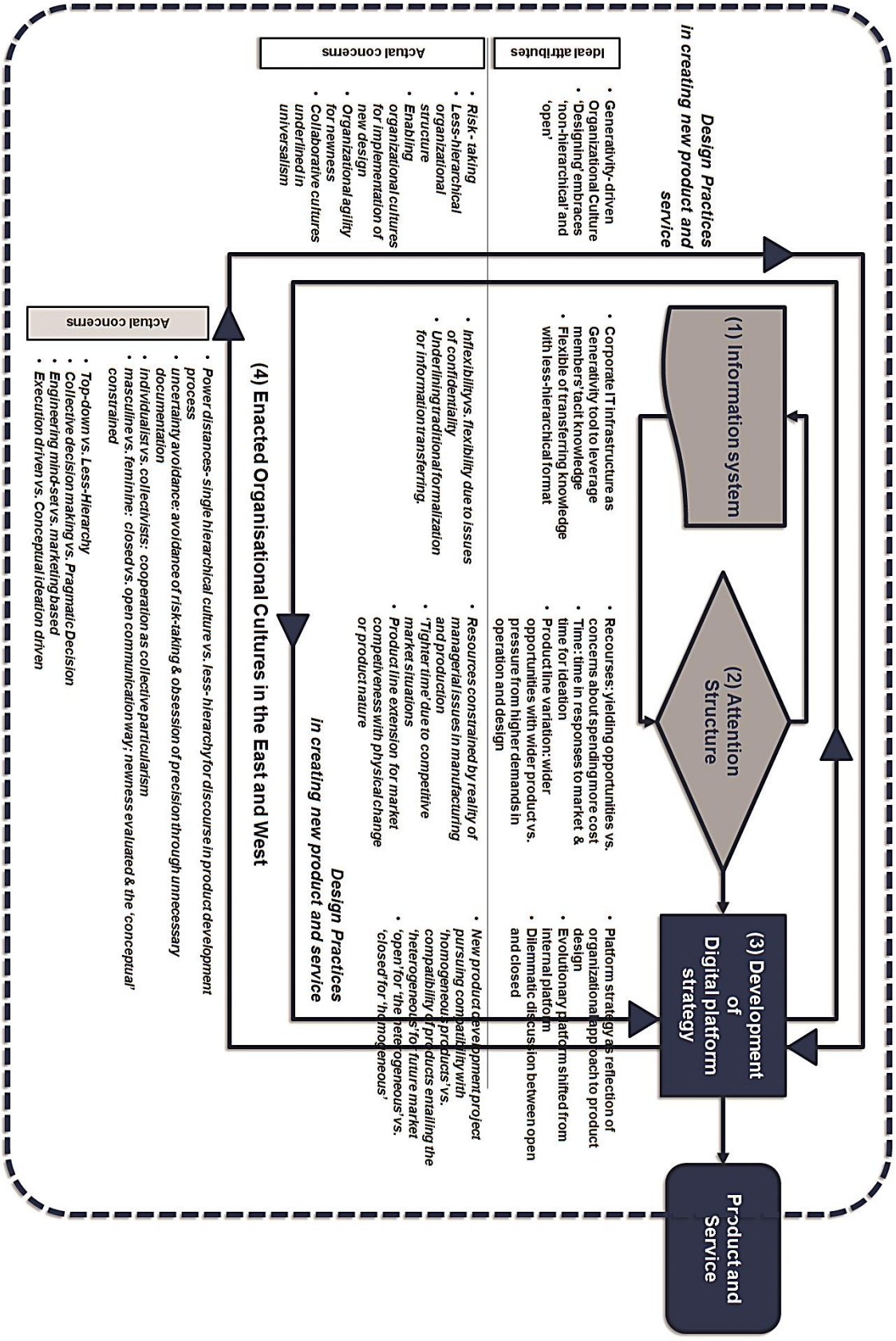


Figure 4.2 Drawn Elements on Enacted Organizational Cultures in Design Practices from Cross-Cultural Perspectives

4.3. Recommendation for Main Study

This phase explored different types of organizational cultures in large East Asian company cases in carrying out their new product and service design relevant practices. This provides a basic understanding of the dilemmatic meaning of *designing* in the digital landscape; whether a new product is a result of '*designing*' with an evolutionary perspective, or 'controlling' - designed in reductionist for efficiency in an organization. It is illustrated in four respects as follows:

- Firstly, incremental risks and uncertainties in a complicated digital ecosystem are overwhelmed across organizations due to the nature of the complexity, and so organizational attitudes toward risk-taking may be much stressed in NPD decision-making. This could be furthermore much affected by the organizational culture with regard to whether the organization can wisely embrace '*designing*' in a holistic manner.
- Next, types of hierarchy in organizational structure and product design can be affected by organizational attitudes towards ambiguities that organizations face: attitudes to risk-taking. This is because of the nature of bureaucratic organizational attitudes, and it could cause the development of different types of product systems reflected in the product platform toward novelty – either for heterogeneous products with holistic approaches or homogeneous products in reductionist approaches.
- Thirdly, *designing* a new product with emergent complexity can result in many dilemmatic concerns, due to much tighter control, depending upon organizational cultures. Although *designing* is underlined in less-hierarchical structures and enabling cultures' *generativtity,* control is required in response to where complicated ambiguities in designing and multiple external participants reside. It could be possible to cause many dilemmatic concerns between tighter control in a single organizational hierarchy and 'design'.
- Lastly, looking at all those implications drawn from this phase, there are different approaches to managing design in organizational cultures in the East and West. So this indicates that the studies on '*designing*' in the digital landscape should be investigated at national level in relation to the complicated web of national industrial ecosystem, supportive cultures and infrastructure for technology development.

Above all, the questions and insights drawn from this phase would be further investigated following the main study by integrating additional multiple data sources.

The following chapter will present more specific findings coming from the analysis of data from the main study: in-depth interviewing (n=18) and qualitative and quantitative secondary data (documentations and archival sources). It will crystallize the meaning of *'designing'* in the digital realm, which is differently perceived by different organizational cultures, and further, clarify how the organizational cultures respond differently in approaches to dealing with new digital products and service designs in the East and West.

5. Findings

5.0. Introduction

This chapter presents the findings of empirical data from qualitative and quantitative data sources. These were analyzed in relation to the theoretical research framework; the map of enacted organizational cultures in design practices consisting of four dimensions: (1) information system; (2) attention structure to new product and service development; (3) development of digital platform strategy; (4) enacted organizational cultures (see Section 2.6; Fig. 5.1).

In a process of drawing out the research findings, this design research adopts a mixed method approach utilizing both qualitative and quantitative data sources in a pragmatic approach, within a case study methodology. This is in consideration of the continually changing stances of product and service design and organizational culture studies research outcomes (see Section 3.2). For this, an abductive reasoning approach is used to provide a new understanding of the relationship between the product and service design practices and organizational cultures in the analysis of the data sources (see also Section 3.1.4).

In this context, the findings are presented and these outcomes are elaborated as the following three key phases: (A) understanding differences in design practices in the East and the West; (B) explanation of the enacted organizational cultures in design practices; (C) demonstration of the findings in reflecting design outcomes (see the map in Fig.5.1).

- Finding phase 1 (Section 5.1.: 'A' in Fig. 5.1) explores the differences in design practices in the East and the West. Initially, this study draws key implications about how organizational cultures in the East and West can be differently addressed in actual design practices in new digital products and services. This part will address the generic differences of elements in large organizational cultures in the East and West, which can affect design practices. It will also address different design priorities in the East and West.

- Finding phase 2 (Section 5.2.: 'B' in figure 5.1) is an explanation of the enacted organizational cultures in design practices. This phase will explain the detailed mechanism of how organizational cultures are encated differently in design practices in order to provide a better understanding of the findings presented in Section 5.1. The explanations will be offered in relation to the dimensions (1) to (4) and to the map in the presented research framework (Fig.5.1).

- Finding phase 3 (Section 5.3.: 'C' in Fig. 5.1) is a demonstration that reflects design outcomes. This part will show how the findings and the elements that affect enacted organizational cultures in design practices can also affect actual design outcomes and the digital platform strategy. This will be carried out with the selected cases of global digital technology companies in the East and West, such as Apple, Google, Samsung and Sony, in the approaches to digital platform strategies and design practices.

These phases will be useful to suggest new theories on organizational approaches to design management from the cross-cultural and international perspectives, as they consider the actual contexts in design practices, as well as organizations that deal with complex implicit and explicit variables to affect design outcomes.

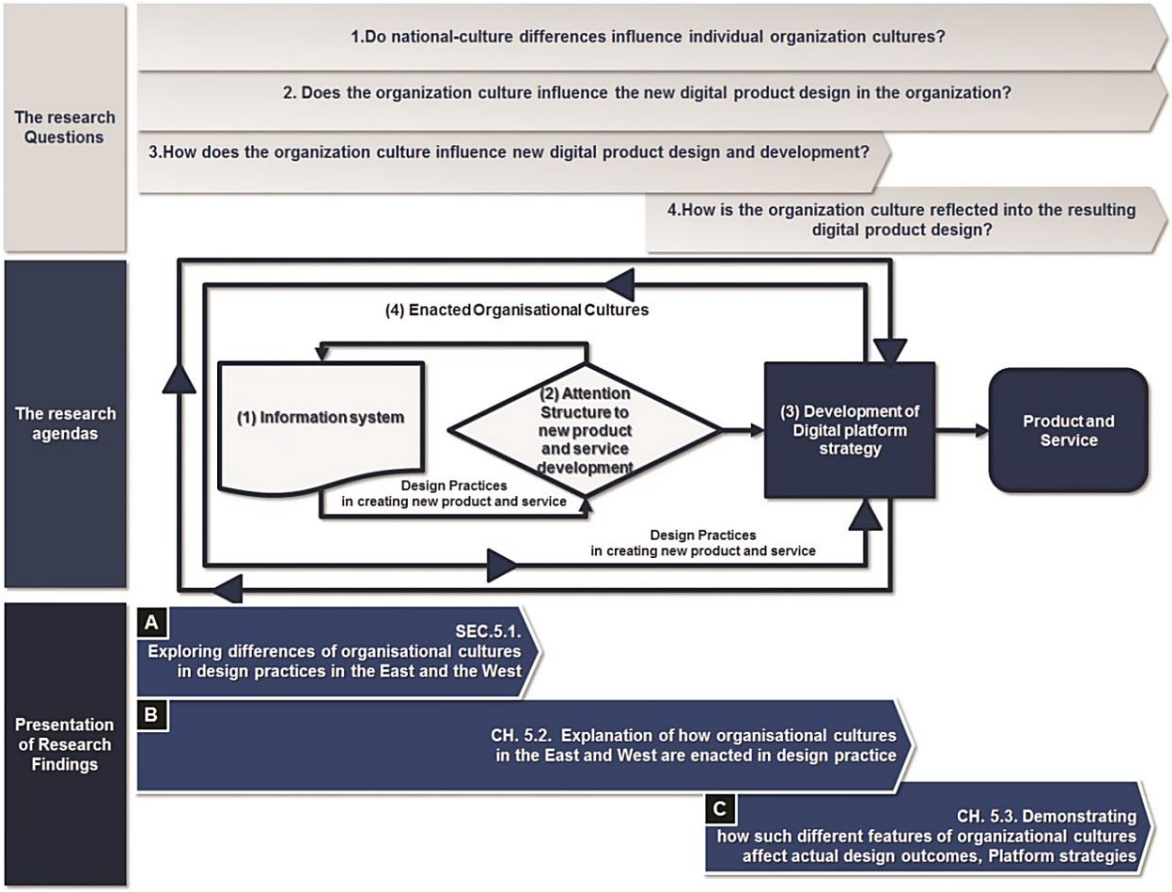
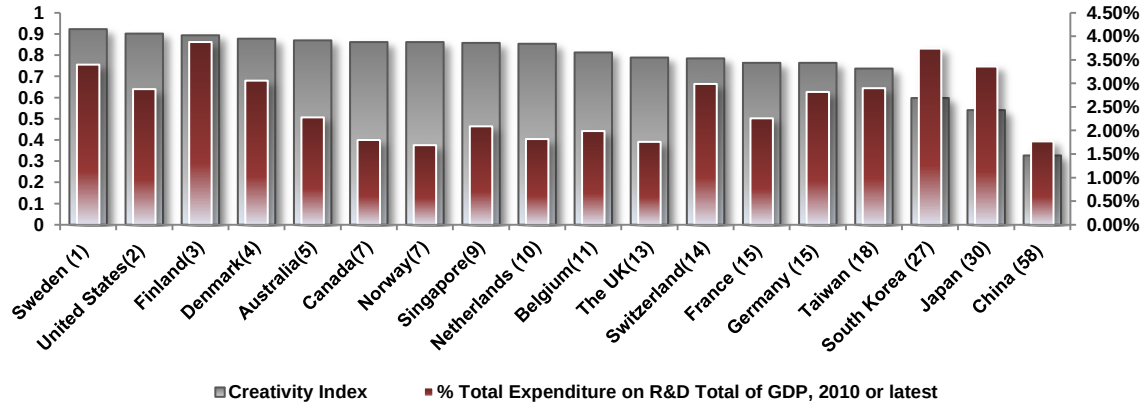


Figure 5.1 Research findings map

5.1. Finding Phase 1: Understanding of Different Design Practices in the East and West

Design Capabilities on Explicit and Implicit Factors



Country	Total Expenditure on R&D Total, $ bn, 2010 or Latest
Sweden (1)	**15.7**
United States (2)	**401.6**
Finland (3)	**9.2**
Denmark (4)	9.5
Australia (5)	24
Canada (7)	28.4
Norway (7)	7.1
Singapore (9)	
Netherlands (10)	14.3
Belgium (11)	
The UK (13)	39.9
Switzerland (14)	15.1
France (15)	57.8
Germany (15)	92.5
Spain (17)	19.3
Taiwan (18)	**12.5**
South Korea (27)	**37.9**
Japan (30)	**169**
China (58)	**104.3**

Table 5.1 Global Creativity Rank (Above) and Technology Capability (Below left), ( ) rank of creativity index (Adapted from Martin Prosperity Institute, 2011; Grant Thomton, 2014)

A nation's design and innovation capabilities are often addressed in quantitative statistical figures in areas of a relationship between the nation's technological capabilities, economic development level, and relevant talents in human resources (e.g., Martin Prosperity Institute, 2011; Grant Thornton, 2014). However, in consideration of enacted organizational cultures and tacit capabilities in organizational capabilities, such explicit figures do not fully represent the implicit design capabilities of organizations.

> **"If you look at the GDP per capita, but then the penetration of trigger things in the West, when people have more choices, you are higher up of Maslow pyramid. Emotional factors and self-expression factors become a more dominant part of your purchase decision […] One of the reasons why companies like Sony and Acer, for example, are struggling is that actually they have got too much cost in R&D in the middle."**
>
> **[EG_3]**

In fact, as the interviewee mentioned, regarding the R&D expenses relating to a country's nominal design capacity; despite massive investment in the R&D of East Asian countries, including Japan, South Korea, Taiwan, tacit design capacity in creativity capabilities is not fully correlated with these countries' economic and technological capabilities figured in R&D expenditure (see Table 5.1.; R&D spending and design practices in organizations will be discussed further in Section 5.2.2.3.2).

In relation to this, the findings in this section will explore elements that can influence enacted organizational cultures in design practices, new product and service design projects run by the Eastern and Western organizations, which are less explicitly presented in such statistical figures (see Figure 4.2; Figure 5.2). These include:

- Differences of shared social values in the East and West (Section 5.1.1.)
- Perceptions about individuals and groups/organizations (Section 5.1.2)
- Different adaptive systems in Eastern and Western organizations (Section 5.1.3.)
- Differences in design priorities in the East and West in new digital products and service design practices (Section 5.1.4.).

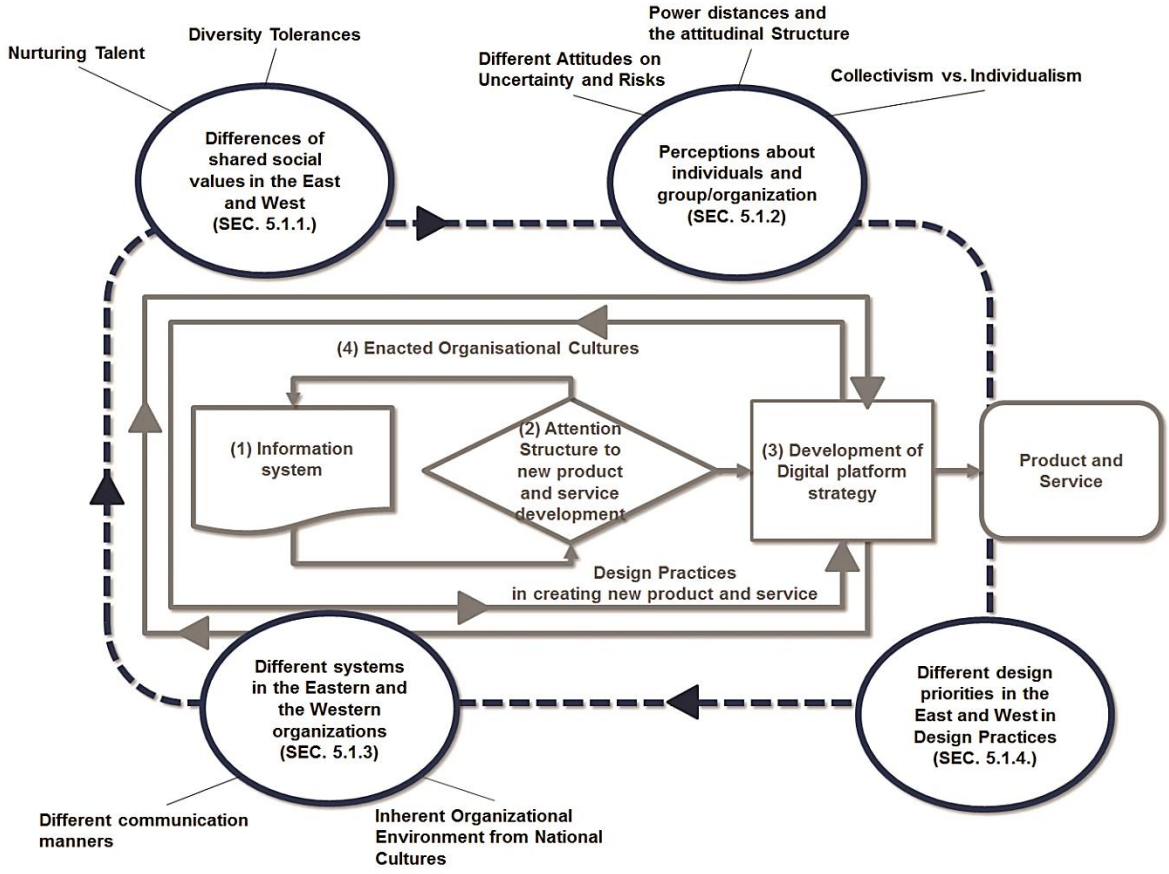


Figure 5.2 Exploring factors that can affect design priorities in large organizational cultures in the East and West.

5.1.1. Differences of Shared Social Values in the East and West

5.1.1.1. Diversity tolerances

Different levels of tolerances towards diversity in the East and the West can affect design practices for new product development. The tolerance level represents the degree of openness to differences in people and lifestyles. It is about whether a place can foster creativity based on such diversity of environments (Martin Prosperity Institute, 2011).

> "We have very huge diversity in the UK that is one of the UK's strategies, there is a massive multi-cultural dimension of the creative industry in the UK, it's very London focused and it's not true that the whole of the UK is multi-cultural and diverse."
>
> [MR_1; see also about the UK diversity in JT_1 and about lack of diversity in Eastern Asian cultures in JH_1]

A design project for new product development is necessarily presumed to take place in diverse environments. However, compared with the Eastern organizations, the Western organizations, such as those in the UK, take more advantage of diversity grounding due to historical and geographical reasons and this can affect design professionals in carrying out more reflective design actions and absorbing those diversities. Whereas, the Eastern organizations, such as the Korean and Japanese, are to some extent characterized as less tolerant of diversity and differences.

The relatively low degree of tolerance to diversity is likely to be related to higher tension in a society that takes care of what people do. Because differences can be viewed as wrong, because the members of the society have never experienced them before, these can also be reflected in actual design practices, which have to deal with immeasurable uncertainties.

> "Does it mean that differences can be wrong?
>
> Yes, if a senior manager or a deputy manager reports to a director and says, "this project seems better than that." If you look at possibilities and probabilities, there is much higher probability to the director because he must have been at the company much longer than the deputy manager."
>
> [JC_1]

In fact, different levels of tolerance to diversity are also reflected in the survey data. The Western European and American countries are likely to accept diversity, yet the East Asian countries are unlikely to show acceptance to diversity, and this can affect the foundation of national creativity. For example, Japan and South Korea show a lower tolerance index; they are ranked 61st and 62nd in the world, and their creativity indexes are also presented in the lowest class of the sample group (Fig.5.3; Martin Prosperity Institute, 2011).

Tolerance Index Rankings	
Canada	1
Ireland	2
Netherlands	3
New Zealand	4
Australia	5
Spain	6
Sweden	7
United States	8
The UK	10
Norway	11
Hong Kong	**12**
Belgium	13
Denmark	14
France	16
Singapore	17
Germany	18
Finland	19
Switzerland	20
Taiwan	**21**
Italy	23
Japan	**61**
South Korea	**62**

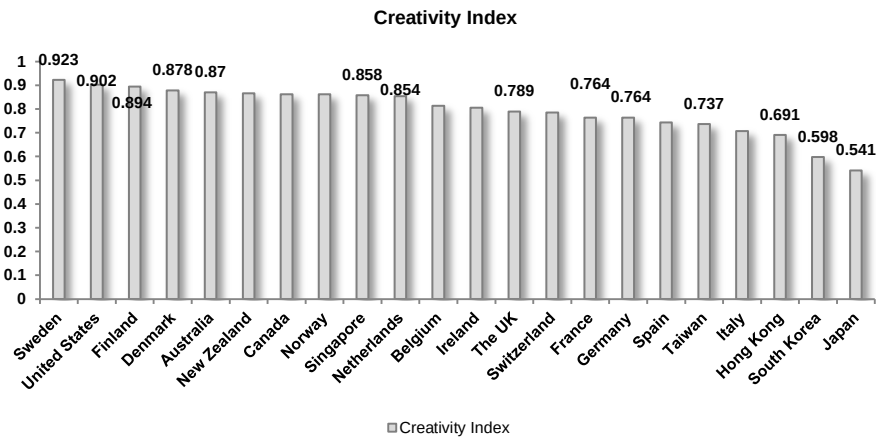


Figure 5.3 Global tolerance rankings and global creativity index

(Martin Prosperity Insitute, 2011)

5.1.1.2. Nurturing talent and the value placed on it

People with talents who engage in design practices are likely to have been nurtured in taken-for-granted socio philosophical value systems. Early education within a national education system can affect design practices later in life. This acts as tacit design capabilities in organizational design practices.

The interviewees stated that the Anglo-Saxon dominant countries have focused on raising critical thinking approaches in early education. This enables individuals to attain 'new truths' from fuzzy and ill-defined problematic situations in the design process, absorbing learning capabilities and knowing 'how to solve'.

"Critical thinking and just originality. It's a cult of individuals. You know. At the heart of Anglo - Saxon culture" [EG_1]

"Well, we are often told that the UK is very advanced in terms of creative industry? I think education itself that they have attained at early ages differs from ours." [SY_1]

This is reflected in different types of education attainments in the East and West. For the East Asian countries, South Korea, Japan, Hong Kong and Singapore have recorded higher educational performance in science and mathematics. However, there has been skepticism regarding the methods of this education system in relation to raising critical and creative talents (The Economist, 2013).

This is illustrated in the area of design as well. These top-ranked East Asian countries have mainly focused on attaining fixed and standardized output with little consideration of 'why read' and 'what to learn'.

This can be associated with differences of interactions between teaching and learning in the East and West (see also Section 2.2.4). This is how early learners accept things between 'new, truth and unstructured' (the West) and 'tradition, wisdom and structured' (the East) (see also Hofstede, 1986).

> "My portfolio is basically based on what I worked on in Singapore. I was shocked as an Asian. Honestly, it's like the problem of my portfolio because it's not kind of like my work is not good. But it tends to be really nice, aesthetic but they were asking, "Oh how do you...get to here? Can you show more of the process?" Even though Singapore is quite advanced, our education system is quite advanced. But our design history is not as rich as China or European countries nor even Korea...or Japan. So, when we talk in terms of design? It is very young in our country." [DT_1]

In relation to this, it is also proven in statistical figures about national talent and the creativity index. A nation's technological capability is not fully correlated with the nation's creativity capacity. For example, South Korea and Japan show a relatively high technology index ranking, Japan (ranked 2nd) and South Korea (ranked 8th) of the sampling group. However, their talent index ranking and creativity index are much lower compared to their technology index, for example the talent index ranking for Japan is 45th and South Korea is 24th and for the creativity index Japan is 0.541 and South Korea is 0.598, in comparison with the western countries (Fig.5. 4; Martin Prosperity Institute, 2011).

Index	Technology index ranking	Talent index ranking
Finland	1	1
Japan	**2**	**45**
United States	3	8
Sweden	5	2
Switzerland	6	22
Denmark	7	4
South Korea	**8**	**24**
Germany	9	26
Singapore	10	3
Canada	11	17
Norway	12	6
France	14	23
Australia	15	7
Belgium	16	12
Netherlands	17	11
The UK	18	19
Ireland	20	21
Hong Kong	**22**	**37**
Spain	24	28
Italy	26	18
China	**30**	**76**
Portugal	32	34
Taiwan	—	32

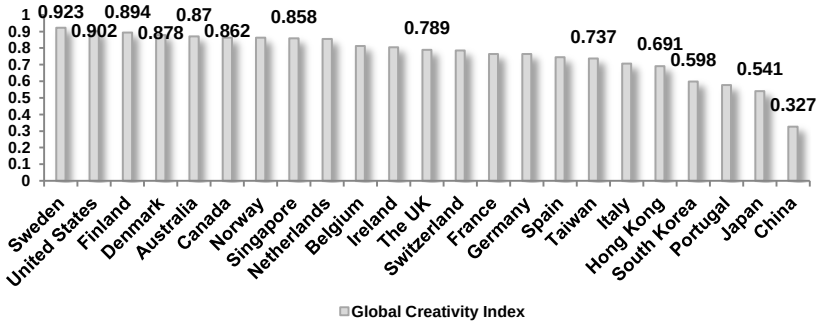


Figure 5.4 Relations among talent, technology attainment (rankings) and creativity index by nations **(Martin Prosperity Insitute, 2011)**

5.1.2. Perceptions about Individuals and Groups/Organizations

5.1.2.1. Powerful collectivism vs. indulgent individualism

Different perceptions of a group or organization that members work for will likely affect actual design practices at the large organizational level in the East and West. The Western organizations are characterized as individualist and this even features as indulgence in work practices; whereas the Eastern organizations value group and collective action themselves (Figure 5.5; Section 2.2.4) (Hofstede & Bond, 1988; Hofstede, et al., 2010). This can affect actual design practices in organizations, as the following statements show (see also Wilson, 2015; Khanna, et al., 2011):

"Korean organization is likely to be a more collective culture [...] in Korean organizational cultures, due to internal communication."

[JT_2; see also JH_2]

"In terms of our attitude towards managing projects, I think what I noticed is that Western organization is individually or more value."

[SW_1]

The implication is that collectivism can be associated with rationalized, structural and linear approaches towards efficiency to achieve maximized outputs in a short time by putting in all the collective costs. However, individualists can foster explorative and iterative capability by enabling individuals' intrinsic reflective capacity within their own liberal ideas; conversely, higher levels of individualism could be seen as an indulgent feature in an organization for collective actions of design practices.

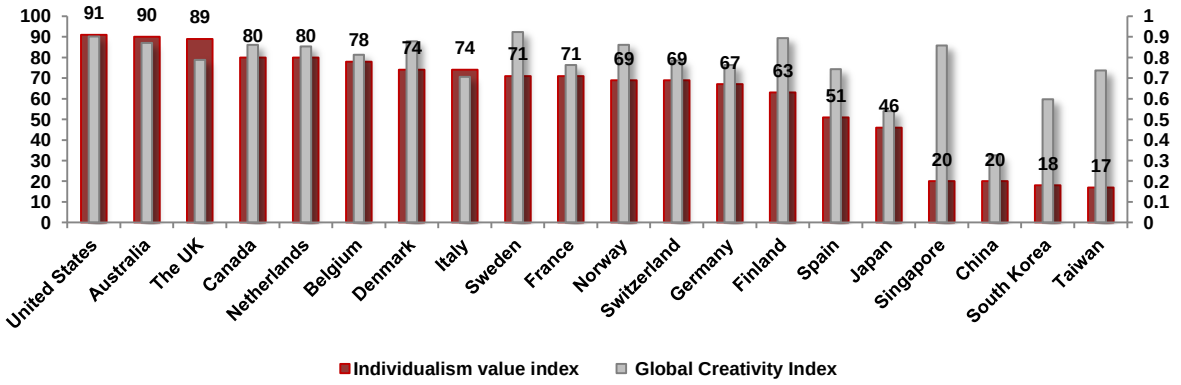


Figure 5.5 Individualism value index and creativity index **(Martin Prosperity Insitute, 2011; Hofstede, et al., 2010)**

5.1.2.2. Power distances and the attitudinal structure

Different characteristics of power distances are likely to influence actual design practices by forming distinctive organizational languages in the Eastern and Western organizations. The Eastern organizations are likely to be dependent upon higher powers and their authorities. But the Western organizations are featured in lower power distances in terms of a relationship between members and

superiors (Figure 5.6; see also Section 2.2.4) (Hofstede & Bond, 1988; Hofstede, et al., 2010). In the East, the superiors – those of senior age or higher rank – are simply respected (without question) and juniors are required to be subordinate to the given structure both formally and informally (see also Khanna, et al., 2011; Wilson, 2015). The subordinates also tend to respect their superior's decision, rather than be independent in carrying out their own decisions. This is to some extent nurtured from the experience of their younger years. However, the qualities of superiors or leaders in Western organizations are described as mentors or supervisors who guide their design practices, as stated thus:

"I think that…Eastern organizations…are kind of from Southern Eastern Asian or Eastern Asia. They are more expecting their top manager's decision making."

[SW_1; see also DT_3]

"Once there are some decisions to be made, the British characteristic is always almost against boss. It is difficult for me to understand or to explain why it is broadly. Whereas, if you go to America, the American dream is I can be the boss one day. So they wouldn't have hatred or distrusted, because all of them want to be there. And so, what you have here is, loosen the strategy of agreement, until boss will say, "yes"."

[GF_2]

It indicates that there are informal power structures between professional design members at their attitudinal level in carrying out design practices. This is distinguished from normative ranks and structures within those organizations.

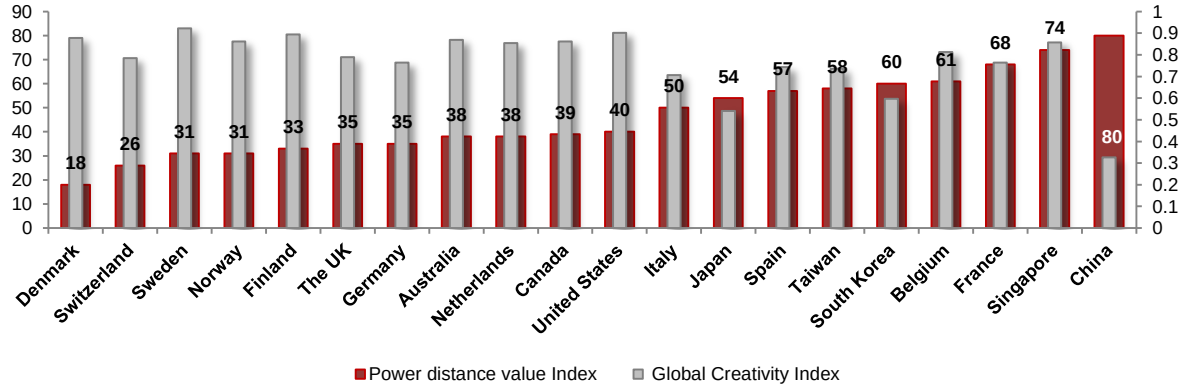


Figure 5.6 Power distance value index (Hofstede, et al., 2010) and global creativity index **(Martin Prosperity Insitute, 2011)**

5.1.2.3. Different attitudes on uncertainty and risks

There are also differences of organizational attitudes in perceiving immeasurable uncertainties and risks in actual design practices. As Hofstede (2010) found in his research, 'uncertainty avoidance', the tolerance against either uncertainty or risks, differs nationally. The different perceptions of uncertainty or risks can also have an impact on new product development projects (Figure 5.7). If immeasurable uncertainty is neglected, opportunities that arise from the conceptual uncertainty are

unlikely to be taken. However, the attitudes are distinctly addressed in all institutional elements, such as financial policy and detailed approaches to new product and service design process as follows:

> **"Accordingly, when it comes to risks, Eastern Asian people tend to be risk averse, relatively. Even if achievement is little, they tend to invest in little risk. For instance, in the case of start-up businesses, there are no genuine start-up businesses at all in Korea."**
>
> [JC_2]
>
> **There are significant differences even in Asian countries like Japan and Korea. The most distinctive difference is attitudes regarding 'risk': pre-management of Japanese and post –or on-going management of Korean businesses. Korean teams rather valued 'time' out of all values, so they undermined pre-risk management and all risks and issues were being sorted out during the projects or after the projects."**
>
> [JL_1]

This could significantly affect the organizations' approaches to managing design in creating 'new' products and services. As Hofstede (2010) attested, it could be related to different degrees of coupling in a certain organizational structure at large organizational levels (i.e., power distance, collectivism vs. individualism) (Figures 5.5-5.7), or this could be the result of different institutional approaches to design practices as stated in the above responses.

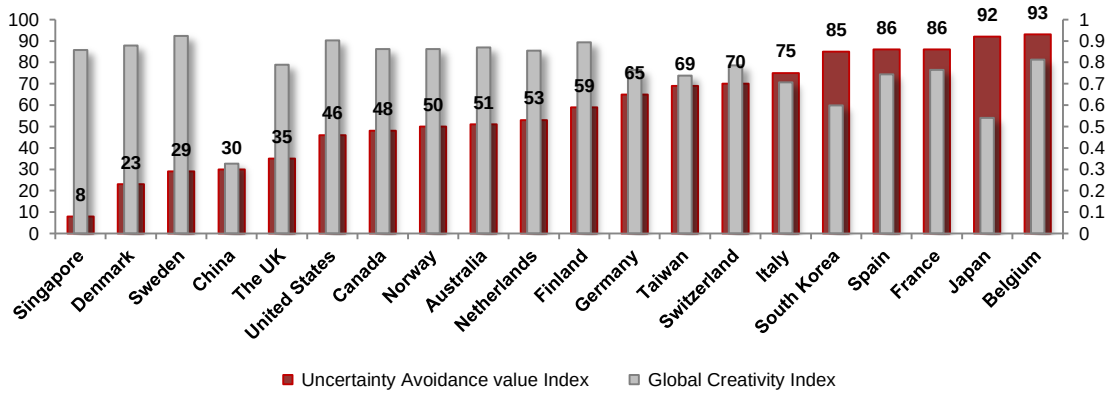


Figure 5.7 Uncertainty Avoidance Value Index and Global Creative Index (Hofstede, et al., 2010; Martin Prosperity Insitute, 2011)

5.1.3. Different Adaptive Systems in the Eastern and the Western Organizations

5.1.3.1. Inherent organizational environment from national cultures

This study found implicit and explicit differences of the adaptive systems of organizations in the East and West. These are likely to be accustomed to a given national environment. Although large global corporations are seemingly run in systematic ways, it is found that a national culture can affect the adaptive systems of organizations and tacit elements – communication manners and style –in carrying

out design practices. An organization's culture interacts with either a local culture (where the office is located) or their head office's culture (where the company originated). This is found in different types of international corporation models: joint ventures, Merger and Acquisition (M&A) and overseas offices as subsidiaries of a corporation.

"When I was working for Sony, I was based in San Francisco and I was having a lot of interaction with Tokyo, like travelling often to Tokyo, but also back into the day. That was the more clear kind of segment of organization."

[JG_1]

"So, the other thing is different, depending on who you work for. So actually I was very lucky in my first job, my boss was Dutch! So, I worked for a much Westernised company already (in Singapore)! And then, my second company, I used to work for was an overseas company (Western company), rather than local company (Singaporean company)."

[DT_4]

The cascaded cultures reflected in actual design practices are characterized as enabling flexibility on the Western side; and coercive inflexibility in the Eastern-based organizations, respectively. Design projects run by the Eastern-based organizations, e.g., Japanese, Chinese, Korean and Taiwanese, are to some degree shown to be inflexible and have a tight management style. On the other hand, the Western-based organizations tend to show enabling cultures.

"When I worked in Sony, this was a really big thing. There was lots of culture of duty there, so people come in at 9 o'clock in the morning and I even found myself staying past 12 o'clock and engineers say "I have to finish this." They work through extra hours and they focus on people kind of pushing forward from the duty aspect you know… China is also similar in that way. They feel like through pushing that resources […] We have more people on this project. We have more, you know, people feel like we need to finish off and then push themselves lot more etc., we can resolve this, we can make better product in Nokia, for instance, in the American culture, it's very different. You can make 7o'clock in the morning and you have a meeting, you tell people what progress you are making and you go off at 4o'clock."

[VD_1]

"You will go to the office in Sweden and the environment is very relaxed, very friendly; people will have coffee breaks twice a day and then leave around 5pm. After 5pm, nobody was in the office. If you go to Tokyo, they will stay super late, like they would leave at 9pm or10pm and there were no social things, two coffee breaks, or not, but the difference starts (in Sony Ericsson*)." […] HTC was a similar situation. I was based in Seattle. Obviously, it was a Taiwanese company and they tried to work very hard, they are competitive, they have a very scrappy team. Now I am in Google, its is more dramatic because not all the team that I work with are in the US, as some of the teams that I work with are in Switzerland, Canada, Australia, and Japan. So I think that Google, for some reason, has managed to preserve this kind of homogeneous culture across the offices."**

[JG_1]

"Although people feel like that they are in trouble with tight schedules, they are likely to follow the way without complaints. It must be affected by Korean organizational cultures. Despite being in the same company, as far as I know, local people who work at overseas offices are also working under a Korean organizational culture. I think it must cause significant collision with the local cultures."

[JS_1]

*** The joint Venture company between Sony and the Swedish telecommunication equipment company, Ericsson (noted by the interviewee)**
**** HTC acquired a design firm, One & Co. in 2008 (noted by the interviewee)**

It indicates that a strong characteristic of national culture can have an impact on approaches to managing design as it interacts with the implicit and cognitive attention structure in carrying out complicated design projects.

5.1.3.2. Different methods of communication

This study revealed that different methods of communication exist in design practices in the East and West; the East featured one-way communication; whereas the West it was rather characterized by an explorative manner.

(1) Differences of explicit methods of communication

(2) Differences of implicit behaviour

5.1.3.2.1. Differences of explicit communication methods: formalization

Design concepts are conceptualized and structuralized by transferring the required information through a systemized design process using formalized activities, such as documentation, presentations and formal meetings, which are communicated among all stakeholders. However, there are differences in the manner of information transfer (i.e. formalization: Section2.3.2 & 2.4.1.3.). This is therefore likely to intrude into the actual decision-making process. It is concerned with following elements:

First, there is a certain different degree of formalization requirement and it is illustrated differently in the way Eastern and Western organizations run design projects. It is an indicator that illustrates different characteristics of organizational attitudes and behaviour regarding the approaches to managing design. The East Asian organizations, e.g., Korean, Chinese and Japanese, are more likely to prioritize higher demands of formalization in concept sketching; documentation and reporting; more substantial writings and explanatory details of documents and reports in comparison with the Western organizations. In general, design practices for new product development contain significant technical information. Subjects of design projects are, therefore, concerned with formalization actions in multiple and iterative methods, in order not to face any risks, such as losing and leaking significant information. The level of demand of formalization that the participants perceive can, therefore, be the indicator of how an organization exploits those significant design practices.

"Meeting culture, they (Japanese companies) spend like for 8 hours doing meetings in the day time. But time for design actually starts after 6 o'clock. Not for everyone. But it's actually happening for some of them."

[TK_1; also EG_2]

"I think the traditional way of using design in Korea tends to do want a lot more, not quality, but volume, volume is really important and you know there is no way that we could have delivered a really succinct report in Korea. It will have to be thick, whereas in other countries, that will be fine."

[MR_2; see also WH_1]

Second, different degrees of formalization represent the characteristics of approaches to the methods of reasoning of an organization**.** When formalization activities are more demanding, there are meant to be more analytical, explanatory, numeric, predictable, measurable and quantitative details within the formalization. However, exploratory, incomplete, or conceptual things are less likely to be accepted. The Eastern-based organizations (Japanese and Korean) are likely to adhere to those demanding details and reasoning in their formalizations.

"The key thing, especially, for a Japanese client, is to be very careful to explain about the process in a slide presentation. This is not to be said as a rational process exactly, but the presentation should be more careful to explain it in a more rational way for Japanese clients. But concept design itself still has a rational process behind it."

[TK_2; see also about Korean manners in JT_3]

Last, these are related to different types of normative and behavioural structures, which represent an organization's power distance and collectivism. Higher demanding formalization could be caused by the tightly-coupled organization structure. All information conveyed in the NPD process is so imperative that the decisions on the delivered information should be considerably incubated through an explanatory and rationalized reasoning process in an organization structure. Information is thus processed through a series of hierarchical orders, being concerned with all unexpected risks within the process. Therefore, it is expected that superiors will guide and supervise in each of these phases (see Section 2.3.2; SEC 2.4.1). In this sense, the Eastern organizations are likely to be featured in collectivist and higher power degrees, as this is related to their more demanding formalizations.

"In the case of Japanese companies, including Korean companies, they tend to ask for much more rational explanations, compared to Western-based companies, for instance, why has the design been done like this? Because they need to convince other people in their company, the personnel who are in charge of the project have more responsibility."

[TK_3; see also about Korean in JT_3 and Chinese ones in WH_4]

This all infers that different methods of communication for cognitive information transfer can significantly affect the actual decision-making process in complex design practices as they are concerned with the level of demand of formalization.

5.1.3.2.2. Differences of implicit behaviour

Differences of manners of communication are also found in implicit attitudes and behaviour that are hardly considered as major factors affecting an organization's attention. However, there are differences in the levels of behaviour and how they are distinguished in the East and West; the Eastern is characterized as more formal; the Western as less formal or more casual.

"There is a massive difference. There were really obvious differences in a meeting in America a few months ago. There were a bunch of Americans and a bunch of Australians, a couple of Europeans...and a few guys from Japan...and Singapore. All the guys from America were just like casual or relaxed, not part of anything. But all the guys from Japan were like this (describing motions: bending waist and shaking hands with a partner politely), they were completely different."

[MR_3 & 13; see also SW_2]

"It's a kind of concept of Western organizations to value your individual themes and capability.so you don't have to exactly follow the hierarchy. I can talk to my manager and kind of sit equally. If you see your office as well, we all sit next to each other, the manager, the director, my senior manager in a meeting. I could be with the company CEO! I imagine that this rarely happens in Eastern organizations."

[SW_2]

However, despite globalization and international design projects that are commonly undertaken in actual design businesses, the differences affect the conceptualizing of design ideas in a design process. The Western organization accepts unfinished and exploratory discussion in a relaxed manner; whereas the East Asian organizations do not prioritize such direct and explicit communication methods; speaking out to express a different idea could cause increased tension in a group. In the Eastern organizations, adequate rationales are failed to be addressed by one person, another difficult explanation or exploitative evaluation will be needed from their superiors and the other group members:

"We require blunt, factual, honest reviews to get the product right! Western clients, however, can beat around the bush a lot and dance around an answer. Sometimes they will delay a decision or differ it to a superior in case they make a wrong call. This can also be difficult!"

[RB_1]

"In the beginning of a project, in terms of process in case of the East, there seems to be structures and a system and a sort of hierarchy. Whereas, in the case of Americans, discussion is very natural for their culture. But someone doesn't speak out they are treated as an 'invisible one', so we need to speak out anyway, well, it seems very natural for them. In contrast, in case of the Eastern Asian they look like pupils who just listen to the teacher's lecture in a class"

[JH_3; see also about Japanese culture inTK_4, and Korean ones in DN_1]

There are different behavioural and attitudinal manners of communication in the East and the West. These have an impact on design practices as they intervene in the critical decision-making processes that superiors and authorities pay attention to.

5.1.4. Differences of Design Priorities in the East and West in New Digital Product and Service Design Practices

Looking at design projects for new product and service design in both Eastern and Western organizations, there are differences in design preferences and priorities. The differences in approaches to design in those organizations are characterized as: textual approaches to design in the East and contextual approaches to design in the West. This is illustrated in two areas: (1) tangibility vs. intangibility in the East and the West; (2) patterns of design priorities interacted in industrial mechanisms.

"Eastern clients want to be better than their competitors and they don't always know how or why. Usually, they add features or requirements. Western clients tend to have the same goal but approach it from a 'better design' perspective - not simply adding complexity."

[RB_2]

"In terms of concept, in Japan our clients tend to enjoy a narrative around design to tell the story about where it comes from and the prominence of the idea. They would be looking for one single big conceptual idea that drives the product and the language that explains of it. I think in Korea, the tendency is to look for a very distinctive visual approach to design. Even if it is kind of crazy thing, as long as it is different. I think this kind of design looks visually different. In China there is probably I think the tendency to look for variation on things which feel secure that are improved by others."

[MR_4; see also WH_2; SY_2]

First, there are distinctive patterns of organization in Eastern and Western companies design projects. For example, the East Asian organizations (Chinese, Japan, and Korea) prioritize 'tangible outcomes and outputs - unique features, materials, shapes, and functions and so forth'; whereas the Western organizations accept incomplete and conceptual 'ideas', as they are concerned with the 'fuzzy problem-solving process' itself. So, it is acceptable to discuss intangible outcomes, such as service design, in Western-based organizations' design projects.

"When we did lots of mobile phone projects that was before 2010. At that time, the mobile phone was thicker and the screen was much smaller than now. So we've got more freedom to play with shape, and so we always play with the shape and also try to apply different materials to it. But sometimes when we try to apply different materials, I feel like it's not necessary. It's the shape that looks different. If you want to apply glass to a whole mobile phone to try to give it transparency it doesn't have any benefit. It just looks transparent…looks different only."

[WH_3; see also about a Korean automotive company's design project in JT_4; and an UK transportation company in MR_7]

Second, the differences in design priorities in the East and West are associated with complex surroundings of organizational mechanisms in given design practices. These relate to the different requirements of design practices for new product and service design, along with evolving technology and design trends that are applied to the design practices. For example, hard system-based companies in East Asia have less understanding of intangible service design due to their inertia of product complexity. As the following examples show:

It infers that industrial, economic and design approaches are all interplayed in new product and service development processes and it can be very differently reflected once a new design principle is

applied to a design practice in an organization: i.e., digital innovation. All of the factors affecting the differing characteristics in design priorities are summarized and presented in Table 5.2 below.

5.1.5. Overview

This section has provided an exploratory understanding of the different organizational approaches to design practices and different design priorities in the East and West. The elements that can affect enacted organizational cultures are summarized below:

- Shared social values are characterized by different tolerances to diversity; learning values shared between design talents within a specific national culture can affect organizational design practices.
- In relation to organizational values and attitudes evoked in carrying out actual design practices, different perceptions exist in groups and organizations in the East and West, such as collectivism, individualism and power distance, which can affect the organizational attention structure. There are also differences of views, which can differ nationally regarding the ambiguities an organization faces, i.e. risks or uncertainties.
- In consideration of implicit and explicit adaptive systems of organization projects in design practices, this study also uncovered differences of organizational environments and of communication methods in information transfer, which are likely to be derived from national cultures in the East and West. In the East they are less flexible, more demanding and take on a more formalized character; whereas in the West they tend to be flexible, exploratory and display a less formal attitude.
- In relation to the above, it is also found that there are different design priorities in the Eastern and Western organizations: the East tends to focus on textual approaches to design outputs, while the West prefers contextual approaches to design outcomes (Table 5.2). This could be associated with those elements that appear in carrying out the actual design practices of organizations.

Based on our understanding of these points, the next section will provide a more detailed explanation of how organizational cultures are enacted differently in design practices.

		The East	The West
Management styles in design practices		• Competitive/snappy in action • Dutiful • Tight scheduled • One-way push/ coercive • Inflexibility driven	• Dramatic in action • Relatively relaxed • Indulgent • Rather two way/ communicative • Flexibility/enabling acceptable
Communication style in design practices	Explicit information transferring in formalisation areas	• Demanding across a design process with tight formalization: visualisation, documentation, reporting, etc. • Quantity prioritised: analytical, prominently explanatory, numerical, and rationality-based details required • Formalization for formalization itself for supervision	• Less demanding in formalization • If an idea is qualified, blunt, explorative, few numerical details acceptable • Formalization for effective communication between participants
	Attitudinal and behavioural aspects	• Formal • Prioritised hierarchy • Clear boundary between speakers and recipients in discussion • Thoughtful and structured	• Casual or rather relaxed • Less concerned with hierarchy • Obscure boundary between speakers and recipients in discussion • Blunt and exploratory
Design Priorities		• Adding features/material outcomes prioritised • Complexity is better • Explanatory design concepts • Prominent visual preferred • Tangible outcomes in framing towards an output/result	• Immaterial outcomes acceptable • Simpler is better • Exploratory design concepts • Conceptual outcomes in exploratory process acceptable • All design outcomes regarded as parts of the process towards problems-solving
		'Textual' Approaches to Design outputs 	'Contextual' Approaches to Design outcomes 

Table 5.2 Summary of generic differences of design management styles and the design priorities in the East and West

5.2. Finding Phase 2: Explanations of the Key Differences

Organizational Cultures in the East and West in Design Practices

In relation to different design priorities in the East and West as presented in the previous section, this section illustrates how an organizational culture is enacted in formulating such design priories (Figure 5.8). Smircich's (1983) taxonomy on concepts of organizational cultures was widely employed and it was decided to present concepts of organizational cultures that can appear in actual design practices (see also Section 2.2.3). Based on this, it will further investigate how such complex design practices can be affected by an enacted organizational culture by looking at details of enacted mechanisms of organizational cultures, reflected in actual design practices.

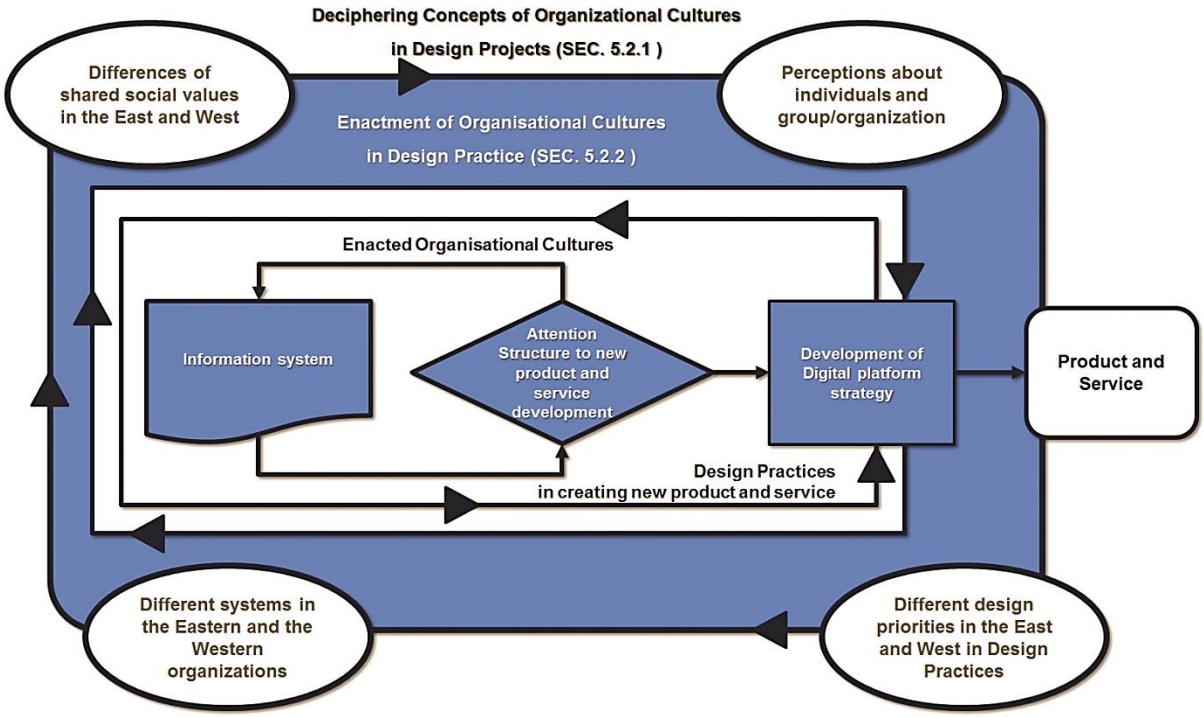


Figure 5.8 Diagram to explain the enactment of organizational cultures in design practices

5.2.1. Analysis of Organizational Cultures in Design Practices

In order to explain the concepts of organizational cultures that appear in organizational design practices, the following sections will address the specific elements, as follows:

Organizational cultures in material practices

- **Cross-cultural perspectives (Section 5.2.1.1.)**

- **Corporate cultures (Section 5.2.1.2.)**

Organizational culture as a root metaphor

- **Organizational cultures as cognitive structures (Section 5.2.1.3.)**
- **Organizational cultures as symbolism (Section 5.2.1.4).**

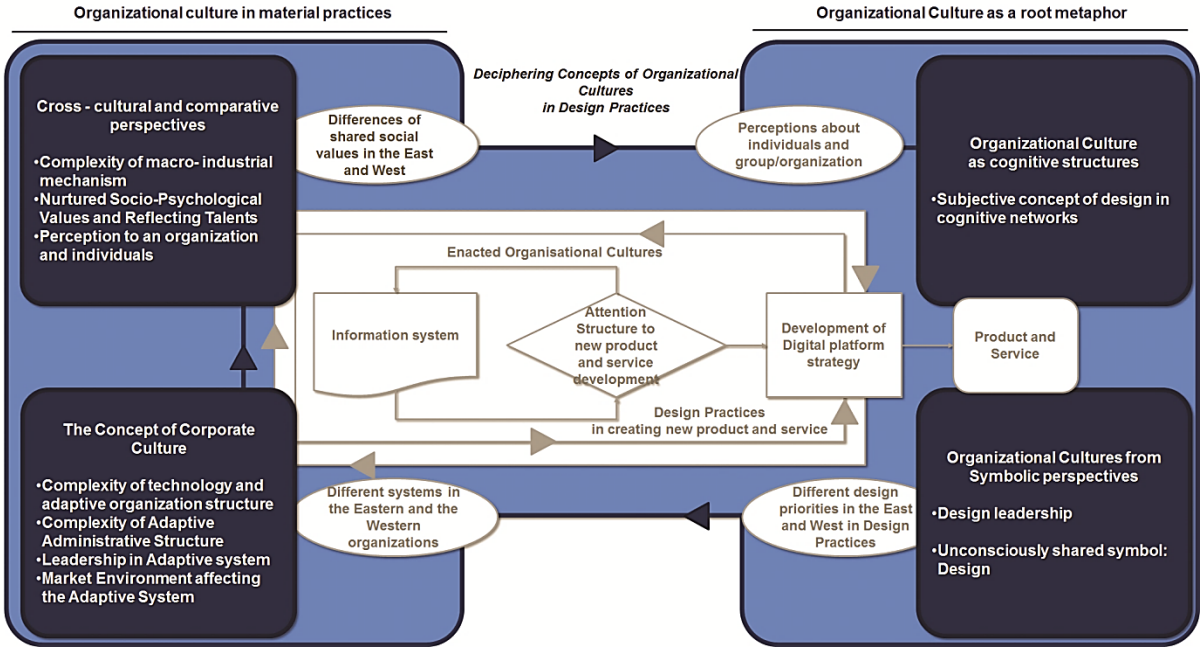


Figure 5.9 Deciphering concepts of organizational cultures in design practice

5.2.1.1. The concept of cross-cultural organization in material practices

This section discusses the elements addressed in the concepts of organizational cultures from cross-cultural and comparative perspectives in design practices. It reveals that a national culture can affect design practices in the NPD process as an interdependent variable. Within a concept of material organizational mechanism there are three key main areas: **(**1) complexity of macro-industrial mechanisms at the national level, followed by individual organization's domain development progress**;** (2) nurturing socio-psychological value systems and the reflection in talents: nurtured socio-psychological values in a national culture; and (3) perception of a relationship between individual professionals and organizations.

5.2.1.1.1. Complexity of macro-industrial mechanisms

Different approaches to managing design in the East and the West are related to their different periods of industrialization, and the different speeds of economic progress that support new technology development for embedding the design. These act as interdependent variables that affect enacted organizational cultures in design practices in the East and West (see also Section 2.2.3; Smirchich,

1983). Through the process of the introduction of industrialization and technology into the East Asian countries of Japan, South Korea and China, the manufacture of heavy machinery and hardware has been under strict national control and support; having developed over the last few decades and learning from Western progress that has been developing and adapting for hundreds of years (Jacques, 2012; Hofstede & Bond, 1988). However, Western organizations are grounded in relatively mature economic and industrial ecosystems, whereas the East Asian organizations are based on shorter histories, along with their high-speed economic progress due to their governmental economic policies.

"What's happening in lots of the developing economies? It is very different. GDP per capita, Canada in the 19 century was ok? North America in the early 20century had big conglomerates and the power was in the railway companies. The rail companies ended up with keeping specific home concepts of hotel, trucks and everything. I will give you a good example in Korea! In the early 1960,s when I was a kid, we had a Korean post shop from a charity [...] because 90% of Korean industry was agricultural .I've never forgotten the progress I saw when I was in Korea in early 1990s."

[EG_4]

"In the NPD process, the most different thing from the Western companies is that Korean companies tend to value 'speed'. This is caused by socio mechanisms that have been inherited from the past, in terms of history and culture. After the Korean War, the Korean economy started off from a zero-base and had to chase developed countries' economic level. That is deeply rooted from the ground."

[JL_2; see also DT_5]

For these reasons, compared to the West, East Asian organizations' business models have shown different roots: family-owned, with a strong alliance to governmental policy. It has been seen as a particularly distinguishing feature from Western standards when explaining the high-tech industry. The Chinese State owned enterprises (SOES) and South Korean business models are often discussed in this context, as stated in the following media (see The Economist, 2011; The Economist, 2010; Khanna, et al., 2011; The Economist, 2015):

"THE founders of South Korea's Chaebol (conglomerates) were an ambitious bunch. Look at the names they picked for their enterprises: Daewoo ("Great Universe"), Hyundai ("The Modern Era") and Samsung ("Three Stars"), implying a business that would be huge and eternal. Small wonder others are keen to know the secret of Samsung's success. China sends emissaries to study what makes the firm tick in the same way that it sends its bureaucrats to learn efficient government from Singapore. To some, Samsung is the harbinger of a new Asian model of capitalism. It ignores the Western conventional wisdom. It sprawls into dozens of unrelated industries, from microchips to insurance. It is family-controlled and hierarchical, prizes market share over profits and has an opaque and confusing ownership structure"

(The Economist, 2011)

In line with this, new product and service design practices in organizations are affected by such a complex web of industrial and economic mechanisms at the national level, because those national environments, including economic and financial capabilities, represent the capability of development of new technology: such as R&D capability supported by a country's economic capability (Tellis, et al., 2009; Martin Prosperity Insitute, 2011). An organization's design capability in new product and service development is, therefore, situated in a relationship of exploitation between a nation and organizations for their mutual explicit benefits (more details to be discussed in section 5.3).

"The UK…has to have an embassy inside LG…because LG spends on more R&D than the UK, the whole of the UK. OK. We have a nice embassy with South Korea. That's very nice; we are happy, but we are actually looking at driving a train. We should be an embassy inside the corporation."

[GF_3]

"A lot of people say that they are still dream of success that many Japanese companies have had for the last twenty or thirty years. Another reason is that previously people didn't listen to how they can fail, , but now more people try to listen. This is changing. It was fine when the industrial revolution happened and when technology did not matter. The way they did things was the best 10 years ago and 20 years ago. But not now."

[TK_9]

Furthermore, in the formation of an enacted organizational culture, aspects such as the national environment, the national policy, systems and the infrastructure also affect a group of designers' sentiments to their design practices. Awareness of new technology and raising individual capabilities for those new design capabilities are included in this.

"First of all, I know that Singapore is moving towards high technology, especially medical devices. So that is where a good market advances…and it might be good for me, I am in the medical field currently, so there may be an opportunity. We never know what is going to happen. But there is another opportunity opening up."

[DT_13; see also TK_6]

It all infers that all such national and industrial mechanisms can have an impact to form an enacted organizational culture in carrying out design practices.

5.2.1.1.2. Nurtured socio-psychological values and reflecting talents

This study revealed that enacted organizational cultures are also influenced by shared socio-psychological values amongst individual designers. An organizational culture is imported through membership into an organization (see also, Fayerweather, 1959; Slocum, 1971cited in Smircich 1983). Different patterns of organizational attitudes are thus a manifestation of the collection of members' values and their attitudes. As Hofstede noted, there is a relevance between the Eastern Confucian culture and economic achievement (Hofstede & Bond, 1988) and the personal nurturing process and its organization culture in teaching and learning (Hofstede, 1986)(see also Section 2.2.4); this study also found that such shared socio-psychological values are interplayed with individual design professionals' reflective actions in undertaking their design practices.

First, these include, social philosophical values, and rituals, and such attitudes are reflected in organizational design practices (see also Hofstede, et al., 2010). The East Asian communities value Confucius for collective interests (e.g., Chinese, Korean and Japanese organizations), whereas Western societies tend to respect individual ones, e.g., hedonism.

"One thing I would like to say as someone who grew up in Asia is that I think there is definitely pros for working in Asian organization. We grew up in kind of Confucius society. So that really influences our way of work."

[SW_3]

"In terms of the West, it's very kind of 'Hedonistic' approach. Japan is obviously a geographically Shin-toe-based culture. So we have the notion of respecting, the notion of trying to be considerate dutiful. So, that has these types of approaches."

[VD_1]

Second, as discussed in Section 5.1.1.2, such socio-psychological values are learned from an early education situated in a national value system. Early education contributes to forming enduring values amongst individual professionals and this is explicitly reflected in their later design practices in organizations. Those educated in the East are unlikely to query their seniors so as to not to disturb the group or be subjected to ridicule (see also The Economist, 2013). This is shown as an obstacle to perform creative ideation in their later design practices in organizations.

"In terms of whether our education is different. In Europe, they tend to encourage students to think, so when I was on my course in the UK, I didn't want to raise my hand and speak up. But in our courses in China, Korea, Japan, Taiwan, Singapore…we are all quiet. But Europeans, they all have lots of comments. Let's imagine school! If you raise too many questions, they think of you as a troublemaker. However, in Europe, if you tend to have a lot questions, the teacher tends to think of you as a good student. You are much more engaged."

[DT_7; see also JH_4]

"When I came to an academic conference, if there were Korean professors there, we should have a very clever question. If we didn't perfectly understand the presenter's presentation and then had a question, it would make us stupid and embarrassed to ask it. But, when I came to an academic conference in a Western country or when I studied in US for MBA degree, in the lectures, for instance, if a question was given about the aspect that wasn't fully understood by a questioner, this did not necessarily mean it was the questioner's fault but the presenters' fault."

[JC_3]

It indicates that shared socio-psychological value systems taught from early education on act as another variable to form an enacted organizational culture for idealistic design practices.

5.2.1.1.3. Perceptions of an organization and individuals

Organizational attitudes and the professional members' collective behaviour are differently enacted in Eastern and Western organizations in carrying out their design practices. This affects the collaborative design practices that underline co-creation and interdisciplinary works that are situated in less hierarchical conditions (note Section 2.2.4 & 2.4.2.2). The central concerns of this are that such a relationship between power distances and individualism-collectivism represent different degrees of coupling of an organizational structure, which could not be fully correlated in such truly participatory work practices at the organizational level (Davis, et al., 1997). However, such features are uncovered in this this study, as the following show:

First, there are different hierarchical characteristics between Eastern and Western organizations. This is characterized by different degrees of power distances and of collectivism and individualism. The East Asian organizations are characterized as vertical, multiple-layered ranks and tightly-coupled structures in organizations in comparison with the Western ones. Thus, the members in the East are

rather more concerned about the informal situations of their superiors, such as age and professional status, which can cause a form of extra, informal political tension in an organization (see also Khanna, et al., 2011).

"I think this is a kind of hierarchy thing which happens both in Korea and Japan. You have boss after boss and next to him, another boss and boss again…after a project you need to explain what you are going to do to him, him… him…your boss. You thus need to be confident to give evidence to explain it."

[TK_8; see also VD_3]

"I think Asian companies are quite hard (and do not have) democratic way of thinking. When we have a meeting at the British company and when my boss talks about something, usually, if you don't agree you can immediately see why you don't agree. Based on my understanding of Asian companies, especially, Chinese companies, it is quite hard for them to be like that, although, if they are really keen they can fight in some way to let their boss know."

[WH_4]

Second, perceptions of an organization as institutional system feature differently in the cognitive institutional systems and rules in the East and West. The pattern is related to organizational attitudes, such as *femininity and masculinity*, against given institutional systems and rules at the organizational level (Hofstede, et al., 2010; Hofstede, 1994: see also Table 2.2.). The Eastern organizations are characterized as having '*femininity'* towards given institutional rules and systems; they have a blurred and obscured boundary between the personal relationship and the institutional rules. It causes political maneuvering in design practices because of the vulnerable perceptions to the institutional system in organizations, as the following illustrates:

"In case of Korean organizations, compared to the Western firms, the rigidity of an organization structure is likely to be weaker. That is because a personal relationship between the member's minds is much more influential than an organization's rules."

[JL_3; JH_5; see also about Japanese cultures in VD_3; TK 7]

"In Asia, I would say, "Who is the one who pays the money? We have power, and then that's the one thing". Because they say then that we are kind of small you should show more respect? Be more polite? But over here in Europe, you tend to be a client, but the thing is that we are "I know we are in business!" partner!"

[DT_8]

In the East Asian organizations, characterized by collectivist and higher power distances, individual professional members are likely to impose higher levels of responsibility on to their group:

More globally educated and experienced people are growing, like this people, but it has only happened in the last decade. There were few people who could understand design, English and business and who could understand being in a foreign country. They were quite rare. Now these people are growing in Japan."

[TK_9]

"How do you connect…because you understand the difference? You understand why people work here. Why people work back there. So you understand the difference and how you connect the bridge. How do you make things work much smoother? Because, the thing is that, a lot of times, you try. Let's say, a foreign company ventured in China and they always had problems. The thing is that you need to have someone who understands the two different sides, where you a sort of make it smoother."

[DT_9]

Perceptions of an organization and individual professional members are significant as this affects the institutional mechanism: roles, responsibilities and structures of the organization within an institutional system. This will be further discussed in section 5.2.2.

5.2.1.2. The concept of corporate culture

In this concept, an organizational culture is conceptualised as an adaptive system. An actual organizational mechanism is structured in a process of producing a certain type of goods or services and an organization structure is configured and designed by being adapted and tailored to a constantly increasing complexity of development of new products and services, whilst dealing with the increasing information flows and the required knowledge (Mintzberg, 1983; Baldwin & Clark, 2000). (see also Section 2.3).

This mechanism is also applied in explaining design practices and organizational cultures, i.e., corporate cultures (Smircich, 1983). In design practices, the concept is closely associated with the complexity of technology applied to design practices and market environments and subsequently it is adapted to the organizational system, structure, and leadership. I will discuss these under the following headings.

(1) Complexity of technology and adaptive organization structure;
(2) Complexity of adaptive administrative structure;
(3) Leadership in the adaptive system;
(4) Market environment affecting the adaptive system.

5.2.1.2.1. Complexity of technology and adaptive organization structure

In the discussion of a concept of corporate culture and the development of digital technology-embedded products and services, constantly evolving technology and its complexity have to be considered, as this is aligned with the configuration of the organization structure. In carrying out design practices, information transfer is significant as it compromises heterogeneous types of knowledge that is applied to those constantly evolving design practices (Yoo, 2010; Yoo, et al., 2010; see Section 2.4.2.2. and 2.4.3). This study found that the whole mechanism is shaped as an adaptive system, which affects the shape of a corporate culture in digital innovation.

First, the shifting concept of design in digitalization causes an increase in the complexity of configuring the product system in the design practices. Adoption of new digital technology and the digital ecosystem, which enables us to integrate heterogeneity elements, affects the increase in complexity of design practices in the development of products and services, for example, the Internet of Things (IoT). This is because digital technology, and the consequent digital ecosystem, infers the configuration of all heterogeneous elements into one digitizing artefact in a holistic approach. The

design elements addressed in creating the artefact could never have been considered previously in the development of traditional products and services.

> **"Recently, in the case of this industry, IoT is included in this case. This is the concept that everything will be realised in the Internet. In the past, the ubiquitous was often mentioned, but it was just limited in the boundary of ideas. Yet, IoT will be commercialised in a few years. To accomplish IoT, all relevant components need to be established for networking with other products. For instance, the ARM Corporation* looks forward to the IoT business as their future sustainable business. ARM products will be equipped in all products for that. For instance, even in the library, books will have the ARM products for the network...and so on."**
>
> **[JS_2]**
> * see also Footnote2 in page 160

Second, although the concept of product and service design, in terms of its product architecture, has shifted from a fixed meaning of a 'good' into an interchangeable and generative one that lies in a digital ecosystem (Section 2.4.3.; Adomavicius, et al., 2008), territorial issues between the heterogeneous design elements increase in actual design projects for the convergence of all kinds of the heterogeneous elements, e.g., the hardware and software systems. Blurred boundaries between products and components (modules) in a given digital platform and the ecosystem are even required for a more in-depth understanding of its heterogeneity across all product systems in a design project. This is considered, not only as explicit and exploitative technical knowledge, but also for tacit, explorative and implicit interactions of learning between design professionals for a much better understanding of the generative digitalizing artefacts.

> **"A digital product is constructed by integrating all elements. So it cannot be achieved by only one project out of all parts of the required elements. All of the tiny elements constitute one product as a whole by negotiating and arbitrating tiny relations of trade-off. So, if one part is isolated from the others, the part is meant to be an outsider, in other words, for better understanding, the key word for this is 'integrated'. But if all these elements are put together into one product for deployment, there are many such cases of failure ...that is 'trade-off'."**
>
> **[JC_4]**

This causes complications in the understanding of all kinds of heterogeneous elements and also in the deviation in transferring information between design professionals in actual design practices, e.g., the lack of understanding between hardware and software and between design languages and engineering items within a certain organization structure.

> **"I had worked with them, ZTE, where you have been in the industrial design department, here, and then next door was department for software design and the UI design department. But there were walls so that they didn't talk each other. One of the reasons was 'who is in charge here, the industrial director, or the UI director?' So, it's about territory."**
>
> **[GF_4; see also about a Finland hardware company in VD_3]**

This infers that increasing complexities in the design practices of digital technology-embedded product and service design, occurs in subsequent concerns and challenges in convergence of

heterogeneous design elements. This can thus hinder or enable the new approaches to design practices to be absorbed within a certain type of organizational structure.

5.2.1.2.2. Complexity of adaptive administrative structure

Increasing complexity in digital technology-embedded product and service design is considered to be a complicated configuration of its administrative structure, followed by territorial issues between them. It is then concerned with an organization's perceptual controlling factors, e.g., allocation of resources and meeting the demands with the spending (see Section 2.4.1. & 2.4.3.2).

(1) Prerequisites to discussing the complexity of the administrative structure

In an explanation of the complexity of configuring the administrative structure, two prerequisites were found in actual design practices, which were: concerns about the size of a unit/group in the reconfiguration/configuration of the organization structure; and perceptual controlling factors (allocation resources) along with the configured organization structure.

"But…those representative companies…such as A and B*…there are giant companies…and there are so many multiple departments at those two companies. For us, we should work with varied departments, such as a strategy team, marketing team and so forth."

[JT_5; see also DT_10]

***both two companies are South Korean electronics companies**

Large organizations are necessarily concerned with their size in allocating and distributing specialized roles to their sub-units. Concerns about arranging sub-units, such as overseas design studios, R&D centres, and specialized design project groups are included in this case. In tailoring these organizational structures, differing approaches to managing design are explicitly featured.

"In previous design projects, in the case of mobile consumer electronics projects, we have done mostly the physical appearance related to mobile phone design and television design, and so on. But currently, these projects have declined significantly; these projects are not outsourced by the clients and UX relevant projects are increasing. We worked with product design teams before, whereas nowadays, it has changed to work with UX and UI relevant teams for research projects and strategy projects."

[SY_3; see also GF_6; VD_2]

In relation to this, one of the major concerns for organizations in the configuration of the units is managing perceptual controlling factors, for example, how to allocate budget/spending to relevant units and how to meet the constant demands for financial benefit afterwards, as the following shows:

So, the structure is the overseas studios get the budget and 30% goes to the local division, so in Europe, Sony Europe has 30% budget, the other 30 % come from …creative center…creative Centre is the head design organization in Tokyo. So…design Centre is referred to…like a module of overseas…so design centers are a kind of 50:50…like half-brothers. One is belonging to Tokyo? The other is belonging to local. Local divisions like…for instance…in the UK

[VD_4; see also GF_5]

(2) Administrative structure is affected by perceptual controlling factors

On the basis of these concerns, a large organization's administrative structure acts to control its design practices. It includes: issues of size and authority, i.e., issues of agility; and these cause implicit political tensions within an administrative structure.

First, there are agility issues in crafting large organizations' structures: in design practices the large organization's size limits deliberately tailoring its structure to fit the digital innovation environment. Crafting an organization's structure to fit into the constantly evolving environment is confronted with challenges in meeting the demands of its large number of members and allocating their roles in comparison with small-sized companies.

"I think maybe 7 years ago, HTC was the mostly OEM and one day they decided that eventually they were not able to compete with lower cost of Chinese manufacturing and they had to offer more value. So what they did was they returned to the design and they acquired. The company called One & Co. in San Francisco. There was, after one or two years, a big jump in quality both of the product and the design, because there was always a direct line with the CEO. I remember many times being in the Taiwan office, in the design studio and at least once a day the CEO would stop by to see what was going on and talk with the designers and so on and there was good communication."

[JG_2; see also about a global design consulting firm in SY_4]

"Ultimately, everything is under one head and one house. So the reason to do the big component like engineering is very difficult! Especially, as engineering is one thing right? A bridge engineer is a bit different because he has to give it to the engineering team to China to execute it. With him, it's fine! If they are actually doing it, they try to a kind of mitigate their mind of work to execute it, so that frustration comes in."

[VD_3]

Next, authority issues for making significant decisions are considered in the configured organizational structure. In a large organization, design units are inevitably interplayed in a complex web of authorization processes across an organization structure, concerned with a series of perceptual controlling factors, such as timelines and allocation of resources for making new products of quality (see Section 2.4.4.). Therefore, access to a key decision-maker is a crucial issue in transferring precise information. Yet, as product and service design become complicated and new aspects are continually required, the information transfer and authorization processes are considerably complicated.

Within this context, the following concerns political manoeuvring and the tension within the organizational structure. For building new products and services, the authorities and the decisions made should reach a consensual point. However, since these units are linked with perceptual controlling factors and the complex web of authorities, the decisions are likely to be involved in exploitative political interests. This causes complicated internal politics and manoeuvring for achieving better interests between them. For example:

"The hard part is getting access to decision makers and to create awareness on executive level. In most cases department leaders are fully aware of the need to implement a holistic solution but in general the companies are not mature enough for that change. Reasons for that are different home-grown solutions in different departments, no overall responsibility and budgets, and different interests in different departments."

[UW_1]

When I came to the head quarter, I felt like that there were a lot of people and they were walking a tight political line, well, it is very critical. It must be the reason why the mobile division is here. Most design is confirmed, not by a head of a design group, but by the head of this office, that is, the current CEO. So, how good the relationship is with the CEO is vital…because we are human."

[JH_6; MR_5]

Above all, this means that, in design practices of large organizations, there are implicit challenges in tailoring and configuring the administrative structures, such as: managing large organization structures; meeting the demands of the authorities; followed by internal political tensions within the organization structure.

5.2.1.2.3. Leadership in adaptive systems

In carrying out design practices for digital technology-embedded products and services, the style of leadership is one of the major interdependent variables that affects, not only the adaptive system of the organization, but also the design outcomes. In organization and leadership studies, there have been debates about leadership, as to whether the leadership is decoupled or coupled with an organizational culture in different types of firms (e.g., Tsui, 2006). However, in design practices for new products and services, embedding digital technology, a leader's beliefs, absorbed knowledge and capacities in the shifting design principles are central to achieving better digitalizing design outcomes. The leader's in-depth empathy and informed understanding about digitalizing products and services is the key to addressing the best design practices. Two areas affect this: a leader's background (academic, professional) and their personal characteristics as shown in actual decision-making, as the following shows:

First, a leader's background is significant in terms of their academic background and career path. This helps to form an organization's collective perceptions of their given design practices. In-depth empathy drawn from a leader's professional background and the absorptive knowledge about heterogeneous types of disciplines fosters interdisciplinary design practices. This can provide direct

guidelines for a design project taking a shortcut. It is shown in the examples of Peter Chou [3] in HTC and Hugo Barra[4] hired by Xiomi.

"[HTC] I think he (Peter Chou) is a mechanical engineer. So he had a lot of appreciation for product design and how to design them. It was direct commands or requests on his side to elevate the design culture of HTC. That permeates to the whole organization because the CEO was protecting the design organization from the rest of the company. The design was able to help to differentiate the products of HTC. […] The reverse happened Sony. When I was working at Sony, our CEO didn't have background in products but in the media. So, Howard Stringer didn't understand the product as much as he understood the media. It was more of product intervention for the media."

[JG_3]

"Well my colleagues who were working for Google said…Hugo Barra was scouted by them (Xiaomi) at that time, who was in charge of Android."

[JH_7]

Next, a leader's subjective empathy towards design is a significant variable affecting a group of design professionals' sentiments towards their work: vision, personality and a tacit understanding of design. Since design practices for digital technology-embedded new products and services are undertaken in a condition of enormous 'uncertainty', this is inevitably considered as a series of authorization processes to reduce unprecedented risks or uncertain issues (see Section2.3.2.). This process is involved in a leader or superior's conceptual actions as reflected in his/her brevities. The leader's conceptual and subjective actions affect a series of decision-making processes, as well as the members' sentiments towards their design practices. An interviewee commented on this with an

[3] **Peter Chou** served as the CEO and a co-founder of the Taiwanese company, HTC: He is a Burmese born Taiwanese. He graduated from the National Taiwan Ocean University in 1985 with a degree in Electrical Engineering. Mr Chou was known more for being a Californian management guru than an Asian corporate patriarch. And he said to his employees, "instead of telling them what to do, I want people to have the freedom to explore their talent." He was a passionate person about all things electric since high school, and much focused on computers at university. Between 1972 and 1997 he worked for the Digital Equipment Corporation (DEC), a leading American computer-maker in Taiwan, and he stated that "That's where I learned the deep-engineering process: turning a concept into a mature product." In 1987, Chou became a senior engineer at Digital Equipment Corporation, but when Compaq acquired DEC (this was later acquired by Hewlett-Packard) in 1997, he founded HTC with Cher Wang (the richest woman in Taiwan, the daughter of a Taiwanese plastics mogul). Thanks to his background, he has shown his passion in building laptops and developed hand-held computers, even earlier than many Silicon Valley start-ups emerged, as he realised that the future belonged to such devices and the mobile Internet. Because of that, HTC was already acknowledged by Western firms (Compaq), who were seeking a company that could design and manufacture high-end hand-held devices and mobile phones: Compaq's iPaq was developed by HTC then. However, during his term as the CEO at HTC the company saw a dramatic decrease in revenue and sales because of its competitive rivals, Apple, Samsung, and Nokia, and it led to his eventual replacement as the CEO by Cher Wang (The Economist, 2009).

[4] **Hugo Barra**, the former Google executive responsible for product development for Android, and was in charge of developing new Google products for international markets. In 2013, Hugo was hired by Xiomi, a Chinese firm based in Beijing, which the firm is rather known for its rival firm, Apple's a copycat.

Barra joined Google in London in March 2008 as Group Product Manager for the Google mobile team. In 2010, he joined the Android team. He was in involved the entire Android ecosystem of software and hardware, such as Honeycomb, Ice Cream Sandwich, Jelly Bean and KitKat operating system launches (up to software), the Nexus 4 and Nexus 5 smartphones, the Nexus 7 and Nexus 10 tablets (up to hardware), and other product lines, such as the graphically enhanced search tool, Google Now, Google Voice Search, and Google's speech recognition service. He was promoted to Vice President in Google in 2012 (The Economist, 2013; Olivarez-Giles, 2012).

example of the Chinese telecommunication company, Huawei[5]:

"I actually work for Huawei. They are really good in terms of innovation, because they are forgivable and they put efforts on people's attitudes. Blame is not good; they are quite brave. They are not afraid of making a mistake. Huawei is quite different. A lot of companies are under states control, but Huawei is a private company. The culture comes from the CEO, its founder and his personality gets into the whole company."

[WH_5; see also EG_10; see also SW_4]

It is indicated that the leadership style is reflected as one of the major variables affecting a material adaptive system within an organization's structure. This is characterized by a leader's subjectivities, his/her background and personality interplaying with his/her empathy towards the design practices. This has functioned significantly in digital technology-embedded products and services that lie in unprecedented uncertainties.

5.2.1.2.4. Market environment affecting the adaptive system

Creating a novel product and service is inevitably constrained by the turbulences of the market environment within the adaptive mechanism. New products and service designs are conceptualized by considering constantly emerging demands from the market (see also Section 2.4.2; Clark, 1985). This affects how an organization manages its timeline for launching new products and services, and a cycle of new products and services begins (see also Sections 2.4.3.2 & 2.4.4.1.).

"All of the patents are mainly considered within a criterion of following the gross net of an idea because lawsuits are also considered in the gross profits of a product. For instance, with a standard of selling products, what percentage would be claimed in a suit, and so forth? So smaller gross profit products are unlikely to be claimed, but larger gross profit products are often targeted."

[JS_3; see also MR_6]

This shows that the reality of the market environment is central to developing adaptive systems in new product and service design and the material mechanism affects the development of an organizational culture as an interdependent variable.

[5] **Huawei** is a private firm in China. The Company was founded by Ren Zhengfei, who used to serve as an engineer in the People's Liberation Army (PLA) in China. But Westerners and its competitors have often doubted the company in that it followed Mao's strategy as the company was told to be in a comfort zone of the PLA. The Western media believes that the 4G telecoms networks the firm is building are used by Chinese spies (The Economist, 2012).

Cross-cultural perspectives	
Complexity of macro- industrial mechanism	**Different times and speed of industrialization in the East and West lead to:** • Different characteristics of exploitation between organizations: Initial domain definitions and business systems, etc. • Different grounding that affects the formation of individual professional members' interests.
Nurtured Socio-Psychological Values and Reflecting Talents	**Differences of taken-for-granted values:** • Confucius grounding in the North East Asia countries – Chinese, Korean, Japanese cultures; • Individualist centric Hedonism grounding in the West **Nurtured talents in taken for granted value systems affecting their later design practices:** • Standardized and homogeneous talents preferred in the East; • Indulgent and exploratory talents accepted in the West.
Perception to an organization and individuals	**Different expectations of hierarchies between members:** • The East expecting higher authorities' decisions situated in a complex web of single hierarchical structures; • The West less interested in a hierarchical relationship. **Different perceptions to institutional systems:** • The East preferred relationships; weaker attachment to institutional rules, feminine; • The West ruled by universal rules, more rigidity to institutional rules. **Different levels of responsibilities in a group:** • The East: individuals likely taking higher responsibility for their groups.

Corporate cultures perspectives	
Complexity of technology and adaptive organization structure	**In organizations, increasing complexities in new digital products and service design, leading to:** • Confusions in tailoring of integration and adaption of heterogeneous design elements; • Difficulties of tacit understanding of an array of heterogeneous design elements between professionals; • Separation of tacit territories between the heterogeneous types of professions, e.g., hardware vs. software design.
Complexity of Adaptive Administrative Structure	**In organizations, increasing complexities in new digital product and service design, causing:** • Challenges to tailor the configuration of large organization's structures' • Concerns about the exploitation across constantly increasing administrative structures, managing perceptual controlling factors; • Concerns about scarce attention and political manoeuvring in the complexities.

Table 5.3 Summary of Factors that affect enacted organizational cultures in material-based organizational cultures

5.2.1.3. Organizational culture as cognitive structures

In explaining how enacted organizational cultures carry out design practices, it is important to understand the metaphoric and symbolic roots of organizational cultures, as new digital product and service design is considered more to be about human enactment, interaction and experience in the use of artefacts. It was found that organizational culture can be a set of cognitive structures for design practices. This refers to the tacit elements in networking between the designing professionals for the conceptualization of design outcomes. This is shown as subjective concepts, within which each professional member, a group, or an organization, understands as cognitive networking (see also, Section 2.2.3). However, this subjectivity is still acted on in a process of transferring heterogeneous types of knowledge to achieve viable design practices.

First, the subjectivity in forming a concept of design is conceptualized, whilst networking and organizing knowledge, in a process of compromising such heterogeneous types of design disciplines. Yet, that is often based on a different tacit understanding of such disciplines:

> **"The other thing is language, use of words because, when I studied for my masters in St. Martin, we had a sort of course in design study., So, all different types of designers were coming into one course. But one of the interesting things is that everyone was talking about the same thing. But you think different works. But no one understands that each other. But it is about a professional approach, a professional culture, what is the way of the thinking system? Is it different? You have to understand "are you talking to marketing people? Or are you talking to the finance guy? Are you talking to engineers? Or designers? Because, they come in at different angles."**
>
> **[DT_11; see also GF_7]**

The organization and its professional members make legitimate such a set of shared subjectivities in design practices. However, there are shared concept limits for the organization to view new concepts or subjects of design, as it is bounded within its own tacit understanding of design practices.

> **"I think that it is the most effective thing that we did, which helped them to reshape way they thought about a way they used design as a cultural tool, in which design happens. We managed change them from having all of the pressure on the design team at the last minute, to actually getting in them to go on to talk to the boardroom. Then to explore what it could do next, getting them constantly tracking what was happening, so that they would be prepared for the future event when it comes to them. They could then act in a more powerful way and the result of that changed the fact that design department had more time to actually design things. Their senior team were more open to listening to what design could do, and as a result of both of those things, their market grew, they sold more products and they are becoming much bigger."**
>
> **[MR_6; see also DT_12]**

Next, such rule-like subjectivities in design practices also affect the development of new design outcomes. It becomes one organization's absorptive capacity and interplays with design professionals in other organizations. It can help an organization to adapt to uncertain capabilities in creating artefacts. However, if it is restrained by certain enduring subjective rules, newer approaches to design are much more constrained by such enduring rules within an organization.

"Design practices must be considered in an in-depth study required by human-centred research, based on social and humanity studies. This must be employed to design outcomes. That is an appropriate design process. However, there are reasons why they somehow ignore the design process. For instance, in the case of America, there is no notable design at all except Apple products. In the case of Sony designers, they tend to prefer 'techy' design. For them, the design must be completed with the perfection of mechanics in the structure. So they often questioned, 'what is that? (the US product design)?! Is the design that has been done through such a design process, including design research, user research or something?'"

[JH_8; see also DT_13]

From the perspectives of organizational culture as a root metaphor, such subjectively shared cognitive assets can affect the formation of an enacted organizational culture in actual design practices.

5.2.1.4. Organizational cultures from symbolic perspectives

As for the concept of organizational cultures as a root metaphor, it also found symbolic perspectives in design practices in organizations (see Section 2.2.3). The central assumption of that is that design practices in actual organizations are generally characterized as intuitive, creative and tacit disciplines, which are rarely documented and codified, unlike other professions, as the following statement shows;

"One of the problems is because industrial design hasn't been fully documented as a profession. Every time it gets to define it as a silo, car design, fashion design, shoe design, whatever. Some of them are very different. Fashion is very different to car design. One of the things that we've done in the British industrial design association head on is that we've actually written and regarded proofs on modern definition of industrial design. It is a new neutral occupation of standards for the industrial design of Britain."

[EG _13]

From this perspective, design is situated as a symbolic concept in organizations in two respects: the symbolic concept of design led by design leadership; unconsciously sharing symbols for design practices, as in the following:

First, design leadership at the organizational level drives conceptualizing such a symbolic subject of design. Visionary plans from long-term oriented perspectives and the approaches to holistic design are related to this. It is driven by genuine empathy towards 'design inquiries', rather than exploitation of design as tactical or technical actions. This is stated as follows:

"Rather than, say, organizations, I would say it's the individuals' social level. So, to a certain degree, organizations are collective embodiments of culture. My understanding of the thing is this is generalization. Actually, I would not say, innovation, I would say, vision! I think Asian companies very often don't express the vision! But I think they might have one! Apple was thinking long-term. It went through a very, very bad time; as a result of that, maybe, now it is where it is in the world."

[GF_8; see also about an US company in JG_3]

Next, a concept of design shared as a symbolic subject is unconsciously shared with designers in an organization. The collection of individual member's tacit understanding of design becomes characterized as the tacitly accumulated design capability of an organization.

"This is an old fashioned way of thinking, which is technology only. But again, this is not anymore. For example, in Sony, they now say that experience is important. Now their mindset is changing. But it's somehow difficult to change the internal process of the organization."

[TK_9]

"This company's corporate culture* might not be the one that can support the passions in reality, one of the things that I feel afraid of is that it is this kind of culture that makes us just simple salary men."

[JH_9]

***a South Korean electronics company**

Accordingly, a shared concept of design as a symbolic subject evolves by interplaying with the surrounding adaptive system, industrial and corporate mechanism and it is formulated as a tacit capacity of an organization, by passing through the turbulence of such a process of evolution. It costs effort, which infers that it is not, therefore, abruptly achieved in exploitative ways.

"Although small, the British empire has influenced many things. Just because of the Empire, somebody decided to put the clocks at GMT, right?. Then speakers said this was here and then financial trading was in London, that city was for many exchanges. I think that we've been doing international knowledge management, knowledge exchange and value exchange, longer than most people. You know, it's much more than in a structured way, which makes us almost unique and capable to be able to accept new things."

[GF_9; see also TK_9]

It is important to understand design as a symbolic subject in organizations because holistic approaches to design are based on the ambidexterity of an organization that can be balanced between exploitation and exploration beyond an explicit consideration of the material mechanism in creating new artefacts.

Organizational culture as a set of cognition
Subjective concepts of design in networking between professional members, groups and organizations, based on their own understanding of design • Becoming like rule-like manners in actual design practices, based on a common understanding of design • Manifested as absorptive design capacities.
Organizational cultures from symbolic perspectives
The perspectives based on the assumption that design is an intuitive, creative and tacit discipline • An organizational culture for design practices is characterised by symbolic subjects of design and driven by what is called symbolic design leadership; • The symbolic subject is unconsciously shared with design professional membership, leading to the tacit design capacity of design beyond explicit consideration of exploitative organizations.

Table 5.4 Summary of Factors of organizational culture as a root metaphor in design practices

5.2.2. Enactment of Organizational Cultures in Design Practices

As discussed in the previous findings (Section 5.2.1), concepts of organizational cultures-reflected in design practices for new products and services in organizations are addressed in various ways. Yet, actual design practices in organizations often take place in the dominant concept of organizational cultures, i.e. materiality-based organizational cultures, emphasizing parts of rationality-led organizations' purposeful actions to produce their materials, goods or services. This section provides detailed explanations about how the concept of organizational cultures is enacted in design practices for digital technology-embedded products and services. This is to be addressed by elaborating organization-environment relations, interdependent cycles of an enacted organization from multiple angles (Section 2.2.3; see also Scott, 1998, p.143). This will be discussed in the following three key themes:

- **Enduring domain definitions: hard vs. soft (Section 5.2.2.1);**
- **Organization structures in design practices (Section 5.2.2.2);**
- **Attention structure and exploitative information transfer (Section 5.2.2.3).**

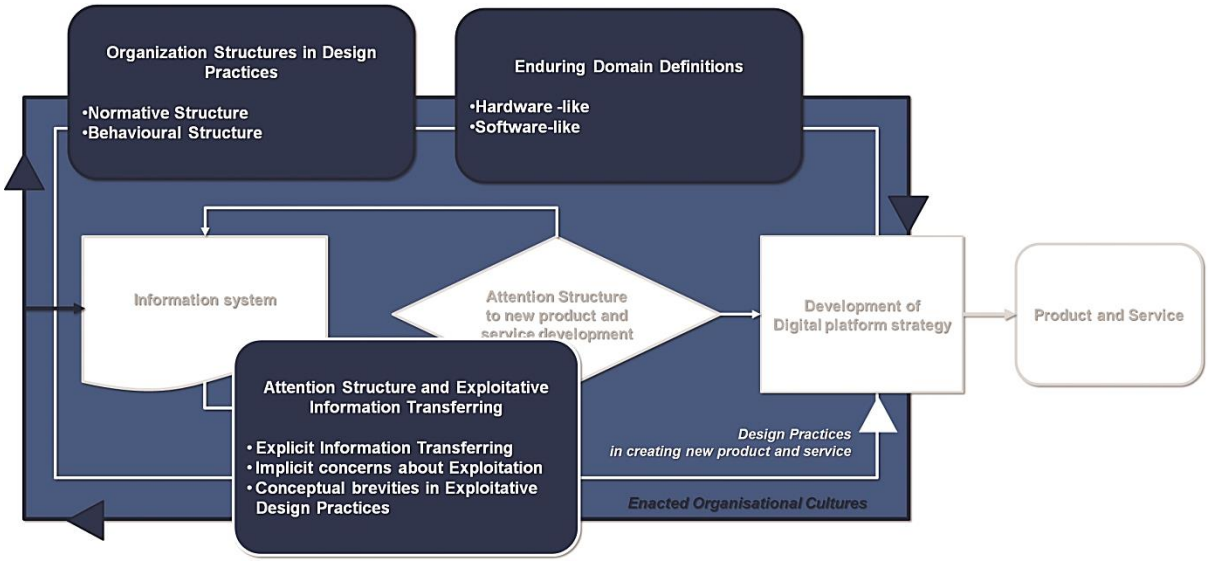


Figure 5.10 Diagram of enacted organizational cultures in design practices

5.2.2.1. Enduring domain definitions: hard vs. soft

Understanding a domain definition of an organization is important in order to identify how an organizational culture is formed and how this is related to its design practices (note Section 2.3 & 2.4; see also Scott, 1998). This study found that a domain definition of an organization, which was formed in its earlier history, can affect the shaping of an organization's culture and impact on later design

practices. The East has hardware domains; whereas the West established a software base. It affects how one firm performs its subsequent design methodologies in approaches to managing design.

In consideration of the design rules of digital technology-embedded products and services, there are essentially two domains affecting organizational cultures: hardware and software domain**s.** In enactment of organizational cultures, these domain definitions contain the following issues: domain definitions affecting approaches to managing design in organizations; influencing members' shared perceptions to the design profession; and emergent challenges in convergence of heterogeneous domains into one digitalizing product and service as a whole.

First, a domain definition of an organization affects its approach to managing design. This can hinder or enable new approaches to managing design for developing new digital products and services. In integrating and implementing heterogeneous design elements (e.g., contents, service, network, and physical elements; see Yoo et al., 2010), the way an organization approaches managing its artefacts has been adapted into its own domain definition's function, such as a business model, process of design and even the member's shared perceptions towards their design practices. Hardware manufacturers' adaptations for making a tangible output have a heavy engineering quality. Their design practices are regarded as styling, adding features and the development of new functions as a part of the whole manufacturing process. The design approaches are usually characterized by reductive senses for managing all expected deviances in their engineering and manufacturing process using measurable data. On the other hand, software domains are, rather, concerned with unpredictable, immeasurable and fuzzy problems that possibly arise from users' immediate reactions; software-centric organizations are aimed to create immaterial attainment that develops the reactions with their system and logic.

"It's more about the business model for each company. So, obviously, Sony and HTC do make money when they sell devices. So the software is something that adds value to the hardware, whereas, at Google, we don't make money when selling devices. We make money by services we offer, and the number of people who use that service. When you talk with the hardware people, they tell you, "Oh, well doing software, you can do whatever you want, you can change, you can do whatever you want, and we are hardware... we are tooling by millimetres, like we need to look into millimetres and specifications, materials or not. But when you talk with software people who tell you, "No! Actually product people have it much better!!" Because they have more predictability, they can change things in all the processes."

[JG_4; see also about Japanese companies in TK_10]

Secondly, a domain definition affects members' shared perceptions towards their design practices. This is interrelated and becomes aligned with the organization's structure defining professional members' roles. In the process, such perceptions of their own design practices- e.g. hardware design or software design- are collectively shared and then absorbed into the designers' mind-sets. Hardware manufacturers' designers are themselves viewed as parts or components that constitute a whole product system, like their product system; their rationales in the design process are featured in the reductive sense, relying on collective actions and its tightly coupled-organization structure for their

linear design process. Whereas software firms' designers consider the entire logic of the design process in loosely-coupled, flexible organization structure, due to their nonlinear design process, yet it lacks reductive sense to deal with such a tight hardware system.

"What you also have to see is the 'technical credit culture' in Japan, Korea and China to certain extent as well. Well, you have incredibly intelligent rational thinking engineers. So, a lot of it is simply that power structure, I mean, we get the same in the West. Organizations do not behave like individuals. Collective decision making is supposed to be rational, but it's actually political."

[EG_3]

All these Asian companies are coming, as you pointed out, it might be because they are coming from hardware and on the hardware side, they have expectations about industrial design."

[JG_5 ; see also JH_10]

Following this, differently determined domain definitions can cause dilemmatic challenges in designing new digital products and services (note digital design rules in Sections 2.4.2 and 2.4.3). This is because of a process of integrating all the heterogeneous design elements into a digitalizing product and service as a whole: hardware domains approach managing design in an administrative type fashion; a new product is one that has new features added on to the existing product with marginal variations. Its aim is to develop the most prominently featured product. While software domains focus on human interaction focused design, the loosely-coupled organization structure is not the best one for building tightly-coupled hardware design. The holistic approaches could be insufficient to achieve a digitalizing artefact as a whole. For example:

"The main challenges that we do not control are our hardware, so we need to deliver more on integration and process of hardware and software design ?, which should be more complicated. When I was working at Sony or HTC, we would design our software experiences based on our hero devices, so to speak. We would design the software experiences around a certain product, Sony Xperia. From them we would design for the experience and they were integrated with the lower devices. Well it was not integrated, but it was simplified, which the devices were less capable."

[JG_6; see also GF_10]

It shows that an enduring domain definition can adopt newer design approaches to introduce something new that contains new technology and requests a newer design methodology.

Domains	Hardware-like	Software-like
Approaches to managing design focused on	• Measurable/exploitative material outputs • Concerned about deviances to be able to be expected or unexpected with technical measurement	• Unpredictable human behaviour • Considering about immeasurable and fuzzy problems to tailor its product and service in response to changing users and technical needs.
Design professionals in a group are characterised as	• Parts of a collective set of units • Underlining reductive approaches within a linear design process	• Pursuit to embrace all unpredictable deviances based on own logic (yet it is not always applicable in case of considering about hardware design)
In convergence of heterogeneous elements	• Exploitative approaches: Adding – on/revision/modification of existing elements for exploitation	• Loosely coupled-organization as challenges in integration of tight coupled hardware design

Table 5.5 Considerations of design practices in the enduring domains

5.2.2.2. Organization structures in enacted design projects

Organization structure is aligned with the organization's domain definition and its function. This study, however, finds that the organization structure is not configured in rationality-oriented systematic ways, with the formal structure looking at design practices. On the contrary, it is formulated in two differing types of organization structure: normative structure and behavioural structure (Section 2.3.2.3; see also Scott, 1998). Understanding of enacted organization structure is important, as it is an indicator to identify how one organizational culture is distinguished from others nationally; and how it is related to the formal and informal power structure intervening in actual design practices. Also, how organizations react differently to risk or uncertainties they confront in actual design practices. The explanation is addressed in Figure 5.11:

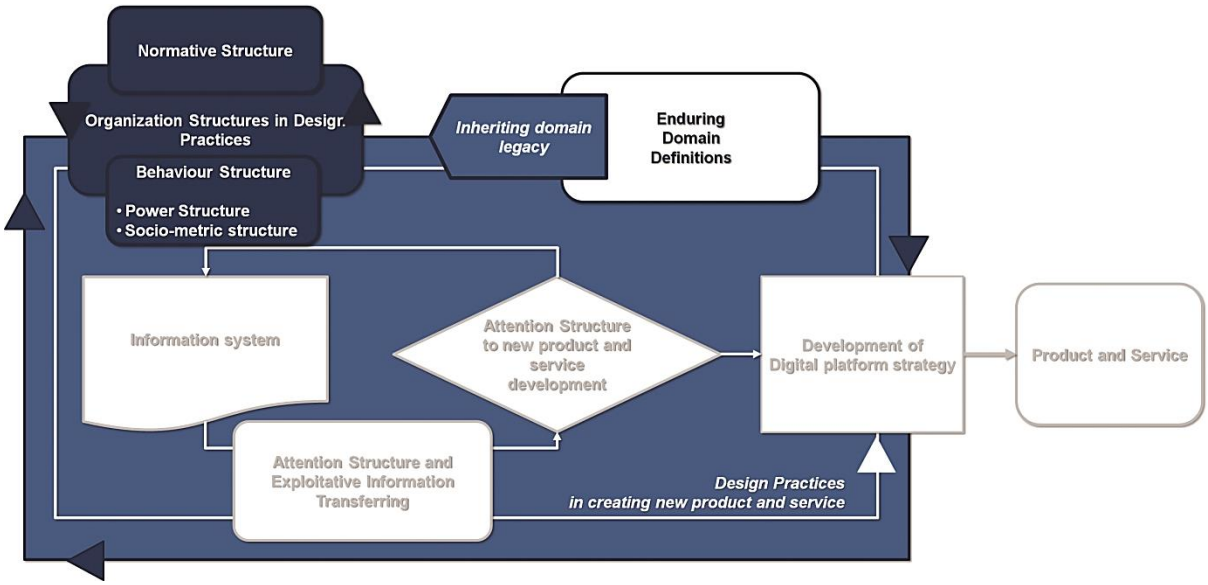


Figure 5.11 Diagram of the organizational structure in action in enacted organizational culture

5.2.2.2.1. The concerns in normative structures

Normative structures of large organizations are associated with the administrative functions of a large organization. This has to do with controlling and tailoring incrementally increasing complexities emerging from the new product and service design process (see Section 5.2.1.2). Specifically in line with the implications addressed in Section 5.2.1.2.2, two emergent issues are uncovered: the size of an organization –unit/ group in the design project in configuration of the organization structure; and the distribution of roles of professionals in the integration of heterogeneous design elements.

First, configuration of a normative organization structure is concerned with its size and ability to affect its design capabilities in the development of new digital-technology embedded products and services: the size of large organizations limits their ability to craft and tailor their structure in agile ways in response to the constantly evolving digital technology environment.

"I think the difficulty of large companies is actually moving in an agile way. I think those kind of eclectic big companies cannot win over small businesses in an agile way."

[MR_9; see also JH_11]

It is difficult for them to quickly arrange and reconfigure design units for newly emergent design and technology trends; increasing numbers of sub-units and design professionals can also cause a series of communication failures in a complex web of authorities and the structure.

" (In case of Sony) We also have a B2B division for Sony Video cameras, etc., and we will get a project from them. But we need to verify it with the Creative Centre because the Sony process is to release a product, from designer's point of view, the design is always validated by four stages of levels.[…] So even though I've worked with a lot of stuff in Europe, I still had to fly a lot of times to Tokyo to show my project to get final authentication […] Sony has very small office (the overseas office), but the central office has 300 designers, in the creative center. While Nokia's office is more split and more equally. I think altogether it has around 400 designers? I don't know, it makes it between 60:40,something like that, 60 in Finland, 40 here (UK). While majority of Skype are in the HQ in CEO? Our office is everywhere, like in Palo Alto etc. The office has 15 or 20 people who are designers."

[VD_4 & 5]

Second, for large organizations, normative organization structure is implied in how they arrange the roles of professionals and sub-units within the structure of an organization. However, design practices for digital technology-embedded products and services are considered to be more complicated multi-interdisciplinary disciplines in implementing varyingly emerging heterogeneous types of design disciplines: engineering, marketing, software design, product design, industrial design, etc.

I think more designers can have a negative impact. Obviously, I am about to start a contract, you know, it's about the balance and skills that we bring to the project. So, what we need to do is not to have more designers. We need to have one expert and that expert could be in design project management or a management owner, engineering, maybe, or even marketing. Where we are working at the moment, we are called a release vehicle. So you know, (it is) in agile."

[VD_6; see also about Korean companies in JC_5]

But each unit has different interests in its own professional discipline and this causes critical communication failures in actual design practices, if the normative structure is not adequately configured. Accordingly, prospective financial costs and time should be taken into consideration.

"It is a pyramid for instance, Sony, but it's not a perfect pyramid. It's more like a serial pyramid. So, Sony Ericson was a pyramid and Sony computer entertainment was a different pyramid."

[JG_7]

When I remind of my experience in R&D center and product planning at LG electronics, those overseas R&D centers have never been meaningful to us at all. Well if it is design research center that only deal with appearance or make-up it seems fine. But, when it comes to product function and performance those elements are never applied to overseas office's cases. A product is the one as a whole that is integrated. But it cannot be accomplished even if one part is accomplished. All parts of details constitute into one product by negotiating all minor trade-off elements. […] The R&D center was unlikely to be the case. All offices must work together in same time line.

[JC_5]

5.2.2.2.2. The concerns in behavioural structures

A concept of organizational structure is not only limited to normative and formal structure. Members' activities, interactions and sentiments also include behavioural structure. This is regularly shown in the formal structure and process (Scott, 1998). Two aspects are found in behavioural structures that are reflected in design practices for digital technology-embedded products and services: (1) exploitative power structure; (2) socio-metric structure within the behavioural structure.

(1) <u>Exploitative Power Structure</u>

Behavioural structure is related to a 'power structure' and this is also found in the execution of design practices. This is particularly characterized as an exploitative feature in complicated design practices. The power structure in the behavioural structure significantly differs, when viewed from cross-cultural perspectives, as related to the differing concepts of hierarchy in the East and West. This involves two aspects: power structures between subordinate subsystems; and attitudinal structures between professional members**.**

First, power structures are found in between subsystems**,** such as design units, project groups and subordinate professional members at the office level, as these are viewed differently, depending on different purposes within the organizations. Depending on the level of value of the subordinate units that the organization perceives, their political power is implicitly determined, regardless of the status of its normative roles.

"Sony is very difficult. Overseas offices are almost like playful things. They are not really like satisfied businesses. For Sony, this is one of the key strategies for growing their designers because in Japan you obviously graduated from maybe a very nice private Ivy league design school and then your professor says "OK, now you go to Mitsubishi, or you go to Sony" and that's your salary man's life. So, for the past 15 years, the Sony office has been led by Japanese senior managers and then local hired staff and some of them are mixed; it's almost like training ground."

[VD_5]

It is also found amongst design professionals. This informal and attitudinal structure is placed in each phase by superiors calling for legitimation of a concept of design: the outcome is assumed to be feasible and viable with a certain rationale.

"Experience of senior level in managers is important. But attitude of creating a team, to be able to be a mentor to people with your team is more important than the status and the experience, which the leader has. That's why you become seniors because you are more experienced."

[SW_4; see also MR_10]

Within that, subordinate members are concerned about the informal structure and their superiors' power structure lines. Abstract informal structure is interpreted differently and this forms as an implicitly shared informal structure of hierarchy that can affect the actual decision-making processes in design practices.

"There are still limitations in Korean organizations that are very negative in effect. If a project carries on and if a following member opposes an executive member it means that the subordinate would be sacked. If a PL (Project Leader) or a researcher asks him to think more in this way, the guys are immediately fingered by the superiors. That is the culture! Fingered by the superior!*"

[JC_6; see also about a Japanese company in VD_5]

*** In Korean the expression means 'humiliated', 'criticized' or 'underestimated' (remarked by the author)**

Furthermore, varieties of multiple layers are found in the behavioural organization structure. Multiple layers of informal power are significant variables for one organizational culture to make itself discernible from others. This is especially different in the cross-cultural perspectives of East and West. In East Asia, there are more multiple layers between middle level members, yet it causes the

breakdown of agile decision-making in actual design practices; furthermore, in the circumstances, designers' roles are seen as narrower in reductive ways.

"In Sony it's hierarchical, but politics are in that, based on teams that are created, based on understanding and mutual respect. We respect each other. So then, whenever we had a different project or even not my own area, we always say "I would like to request to 'Ra-san". Because he trusted me because he makes sure he is boss. The boss authorizes me! It's then like a sub-hierarchy. It's a weird mechanism, it's not like army, where one orders like a machine; it's very political, very group oriented."

[VD_3; see also TK_11]

(2) Socio-metric structure along with exploitative power structure

In behavioural structure, **socio-metric structure** is found. There are certain patterns of sentiments amongst design group members, whether or not they tend to be attracted to carrying out their actual design practices within their organization structure. This broadly comes from attitudes of 'an individual member to a group/ organization'. It is related to certain psychological concerns of members about unprecedented and uncertain situations and risks that individual members can confront while carrying out their design practices.

First, whilst carrying out design practices, an individual designer, as a subordinate member of the organization, is concerned about the success of his/her work from an individual sense and that of the entire corporate mechanism. For the individual designer, all corporate directions are not always rational; instead, the individual considers the abruptly emerging variables that their organization will possibly ask for. The example of design project in Sony[6] can explain this.

"Vaio? One of the projects we had to use in the Japanese factory meant they actually went out of business within given project. So I wanted Chinese (factory), because they have better infrastructure, better quality and better production, but I had to use an old Japanese factory because it would actually have been closed down. People would be fired."

[VD_7]

Second, as subordinate members, personnel in design practices are concerned about their security of job status. This concerns a certain power structure between the subordinate professional members and their superiors, related to unprecedented criticism that subordinate professionals can confront. In design practices, it is important in developing new concepts for creating novel design outcomes, yet, the superiors' negative reactions against subordinates' ideas can place restrictions on the design approach.

"We are faced with a creative workshop. There is no bad idea, you know, if someone has come up with great idea. You can take it and you can even make it better. You don't look at, negatively and say "no! It's a bad idea!" In terms of role of leader or top manager, I think still in their experience they supervise to monitor and to kind of praise the best ideas, including his own idea."

[SW_5; see also about Chinese cultures in WH_5; and about Korean cultures in JC_7]

[6] As the interviewee, VD stated, in fact, Sony announced it was to sell off its VAIO computer division to a Japanese investment fund in Feb, 2014, in order to focus on its mobile business (Byford, 2014; The Economist, 2014)

Next, individual designers want to feel their status is secure in their design practices; this affects their psychological state, and whether or not individuals can pursue genuine design inquiries of their own creativity and initiation. In uncertain and turbulent organization environments, members turn their attention to internal political issues for safeguarding their positions, rather than to design issues.

"In Korean companies, the general managers or the deputy managers are not meant for the persons who have passion, but such persons who are good at political games and get used to the internal politics."

[JC_8; also JH_12]

It illustrates that attributes that differentiate an organizational culture from others are associated with differing power structures and shared membership within the behavioural structure. This can be linked with the other attributes found in domains and normative structures as the following table shows (Table5.6):

Organization Structure		Considerations
Normative Structure		• Large organization's size issues • Distribution of roles and speciality to design units • Distribution of roles to individual professionals
Behavioural Structure	Exploitative Power structure	• Perception of powers between subunits and offices; between members, affecting design concepts and normative organization structure • Arrays of multiple layers of exploitative power structure in an authority web
	Socio-metric structure along with exploitative power structure	• Individual professional members' attraction to their groups and organizations in carrying out design practices • Subordinate design professional members' job security within a exploitative power structure in carrying out uncertain design practices • Political manoeuvring in an exploitative organization structure

Table 5.6 Considerations in large organization structures in design practices

5.2.2.3. Attention structure and exploitative information transfer

Organization structure is developed as information, which is used for reducing 'uncertainty' in organizations, is confronted and collected. In the process of the transfer and collection of information, decision-making is necessarily required by multiple authorities (see also Section 2.3: see also Scott,1998). In this sense, this study offers detailed explanations on how communication methods can differ (section 5.1.3.) and how it is a matter of organizational cultures in design practices. This is discussed by focusing on the following two areas (Figure 5.12):

(1) Information transfer for exploitative learning;

(2) Implicit concerns about exploitation;

(3) Conceptual brevities in exploitative design practices

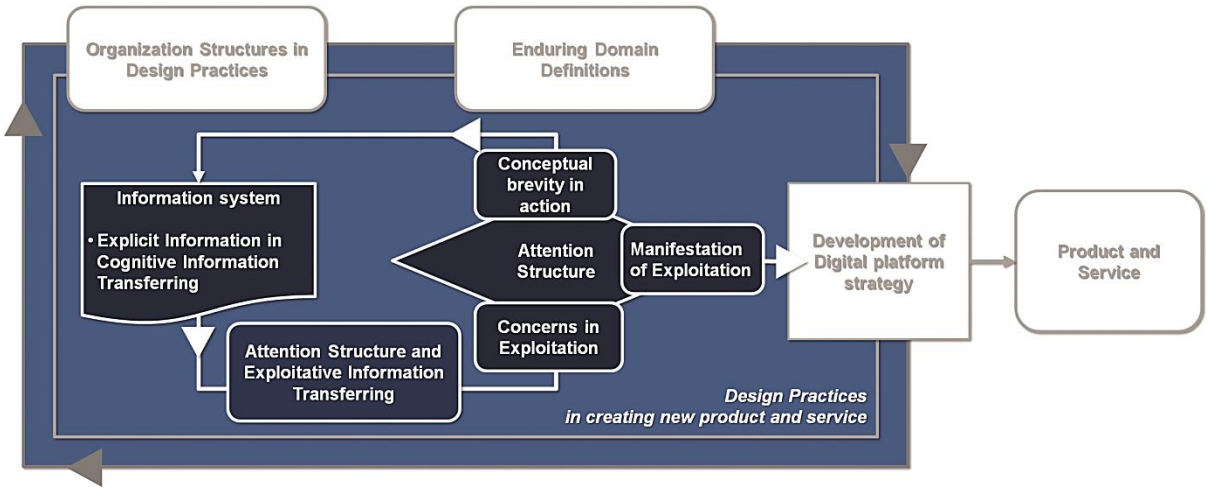


Figure 5.12 Diagram of the attention structure and exploitative information transfer in enacted organizational culture

5.2.2.3.1. Information transfer for exploitative learning

Information in carrying out design practices is transferred at explicit levels between organizations and professional members, yet, it has limitations in conveying tacit and implicit knowledge for a better understanding of complicated digital technology-embedded product and service design (see also Section 5.1.3.2.1). Such advanced information systems can help effective and efficient communication but this shows limitations for tacit understanding of such complexity of digital artefacts. These information technology infrastructures for co-creation, e.g., crowdsourcing using open source software or a web platform, including online conference calls; ERP (Enterprise resource planning) systems provided by large vendors, such as Skype, SAP, ORACLE etc., limit the transfer of heterogeneous types and different levels of depths of tacit knowledge amongst design professionals. There are still difficulties in absorbing tacit organizational capabilities and co-creating valuable offerings (see also, Pisano, 2015).

"The systems are really bad. I don't think they are that useful. There is an element where the organization has to have a certain level. I think it requires a certain deployment. I think SAP is good example, also HR tools!! Because maintenance for organizations has more become difficult because of geographical differences, there are many people, you cannot keep employment of people maintained but those tools are a kind of B2B, not as a single solution, not as a dedicated solution."

[VD_8; see also JH_13; JC_9; MR_11]

Two reasons were uncovered about why such information infrastructures can fail in carrying out genuine design practices: high-profiled information in the design process; and heterogeneous types of knowledge.

First, the information for complex digitalizing artefact design is characterized by being highly reliable and profiled for an organization; leakage of the information can affect the success of corporate performance, so all the information transfer processes are formulated by formalized documentation (formalization), in order to reduce unforeseen risks. This is especially the case for intellectual

property issues, which are significant in these design practices.

"In case of patent issues, we take a look at this with multiple criteria. If there are no coincidences or similarities, we can move on. Actually, even if there are lots of inventions, it is quite hard for really new inventions to come out. So we have a look at an idea roughly because there must not be really new ideas to come out. Mostly, patent lawyers go over the documentation and revise it with their own jargon."

[JS_4; see also GF_12]

Second, design practices for digital technology-embedded products and services are conceptualized and constructed through integration and convergence with heterogeneous types of design elements, using homogeneous types of digitizing data (data in bits of 0 and 1) (see Chapter 1; Yoo, et al., 2012), from components to product architecture level and from contents to the physical device design for building software and hardware. Yet, these types of knowledge, which are used for the design practices, are addressed within the limited boundary of their own disciplines in actual design practices. The knowledge used for building one component or content is not able to be fully understood by other professionals, so that, as a product system and the use of technology becomes more complex, possibilities of failure to transfer the required information increases - such as risks of misconception and leakage of information. Generative design practices in organizations are fundamentally restricted at this level.

"Engineering is different from general management knowledge. Knowledge about management is not necessarily deep. It doesn't need to get into depth knowledge. So the index of level-up could be different from management knowledge."

[JC_10]

For that reason, information transfer for gaining significant knowledge about digital technology design is prioritized in tacit learning ways; tacitly accumulative capabilities cannot be neglected, as the knowledge and requiring information are much more complicated and heterogeneous in open system contexts (see also Cohen & Levinthal., 1990).

Within the context of information transfer for design practices, implicitly emerging organizational characteristics, i.e., organizational cultures, intervene in the rationality-based decision-making process, as the design practices are placed in increasing complexities.

"The extra wow-factor always comes from being more personal with the team - even in a large company - but remaining totally professional at the same time. If you build a relationship, then it helps a lot. Otherwise, we would just be someone to blame if something goes wrong!"

[RB_3; see also UW_3; MR_11; GF_13]

"Here in Germany, people expect German native speakers to act as consultants. They just feel bad and are afraid of being misunderstood if they need to speak English. Therefore, we can't send Dutch consultants to a new client, even if they are very experienced."

[UW_2]C

The implications drawn from this dimension are the significance of tacit and implicit knowledge exchange in complicated design practices; it is, however, fundamentally hindered by a reality in information transfer. In the process of exchange of seemingly tacit knowledge exchange, significant concerns and challenges emerge in organizations' design practices. Intervention of organizational cultures occurs in order to manage the emergent uncertainties that arise with no rational explanation.

5.2.2.3.2. Emergent concerns in exploitation

On the basis of the above explanations about the limitation of cognitive information systems, the decision-making process is now considered in the organization's attention structure (see Section 2.3.2.3). Design practices for new product and service development are not fully systemized in approaches to managing the design practices, but are seemingly rationalized to achieve measurable financial outcomes: organizational attention structure is featured in immediate and superficial ways, relying on an organization's collective concerns and its tacitly accumulated capabilities in undertaking its complex design practices. This can be reflected as follows:

(1) Perceptual controlling factors in exploitation
(2) Manifestation of concerns about perceptual controlling factors

(1) Perceptual Controlling Factors in Exploitation

Although design is presumably aimed to propose a future direction, reality is often confronted with dilemmatic challenges (note Section2.1; 2.4.2), because design practices for new products and services at an organizational level are necessarily concerned with risks and uncertainty once a new product and service is launched. For that reason, in carrying out design practices, organizations consider the explicit benefits, whilst managing the design. Such elements are named as perceptual controlling factors that emerge from the actual decision-making process of organizations in new product and service design practices (see also section 4.2.2), such as allocation of resources and timeline management for exploitation. However, this study found that these traditional elements sought after in new product and service development are also highly regarded in digital technology-embedded product and service design practices, and considered as the main attributes constituting an organization's tacit absorptive capacity. This includes:

- **Direct and indirect costs incurred in research and development (R&D) and manufacturing;**
- **Timeline management issues in design practices.**

Thus, these issues are the indicators to empirically evaluate how an enacted organizational culture is interplayed with those elements in actual design practices.

1) **Issues of cost (allocation of resources)**

Primarily, actual design practices for new digital products and services are necessarily concerned with such allocations of resources. The major concerns are about direct[7] and indirect cost[8] incurred in R&D management and manufacturing. Direct cost affects feasibility in the deployment of new products and services, related to all perceivable phases regarding the development and assembling of components and products at the expense of manufacturing; this is one of the perceivable concerns that all organizations confront during their projects for their subsequent revenue.

"It is lots of things to do with manufacturing. A recent example, two weeks ago I was in a meeting where someone was designing something in a specific way so that they got a better looking product that delivered a better consumer experience. And the stereotype is of significant cost."

[MR_10; also JS_5]

Indirect cost in design is associated with creating novel products as the cost units are often incurred in research and development for applying the new technology. This overhead cost is categorized as an intangible asset that is to be determined as either a loss or a profit in research and development, depending upon a company's ensuing finance and accounting results (Scott, 2012, p.264); that is thus written off once it (a loss or profit) is incurred on the balance sheet. In this sense, it can be, therefore, controversial to be managed at the organizational level.

"All of the patents are mainly considered in a criterion of gross profits of an idea because lawsuits are also considered in the gross profits of a product. So, if the development cost is higher in an initiative, it is not a good idea at all."

[JS_6; also EG_5]

For that reason a novelty product may be affected by such an organization's intervention, as it is concerned with its financial capabilities. It infers that conceptual and abstract design ideas are apparently situated in an organization's collective rationales, with measurable and mathematical evaluation.

"It's common sense to save money in a way that they spend it. Because you generally make something and the same things in a number of different ways and it is almost identical. But one of those ways costs five times as much as the others and if you haven't experienced it, you do not think about things in right way, you may spend your client's money in a very bad way".

[MR_8 & 12]

In relation to this, a simple logic of business accounting and finance is drawn regarding those costing system issues occurring in organizations' design practices. This is explicitly shown with aggregated figures in a company's earnings (i.e., income statement): the direct and indirect costs in R&D and design practices are figured in the operating expenses in the income statement, which is related to

[7] **Direct costs** are costs that are directly traced to a product or cost unit, including *material cost* and *direct labour cost* (Oxford University Press, 2009; McLaney & Atrill, 2010, p.352).

[8] **Indirect costs** refer to expenses that cannot be traced directly to a product or cost units and this term is interchangeably used as **overheads** in traditional cost units (Oxford University Press, 2009; McLaney & Atrill, 2010,p.352).

total life-cycle costing[9]. This can be useful to empirically evaluate how these perceptual controlling factors are concerned in carrying out design practices (this will be analyzed further in section 5.3.).

2) **Issues of timeline management**

A reality of the design project is being confronted with the challenges of limited time and timeline management. The organizational capabilities can be thus reflected in time planning to produce long-term oriented design outcomes by balancing exploitatively generated short-term oriented design outputs.

"One project goes on for seven months because I've done one design and something else. So if we design and redesign something, we need have a kind of half people who are put in place to make quick, tactical and multiple decisions."

[VD_6; see also MR_10; GF_14]

It infers that design practices are significantly constrained by such organizational demands to fulfil shorter-term oriented expectations for its exploitation.

3) Drawing indicators for evaluation of enacted organizational culture

Based on an understanding of the perceptual controlling factors, it can draw a couple of indicators to empirically evaluate organizational attitudes in an enacted organizational culture. For this, this study for analysis of the findings initially employs a simple business accounting system showing firms' activities, i.e., measuring operating profits[10] of corporate income statements as shown in the following principle. This is figured and shown in a firm's annual and quarterly income statements, so that the longitudinal details can be traced by breaking down the figures.

- ***Operating profit = Gross profit (turnover: sales of product or services – cost of sales: including direct costs of goods and manufacturing expenses) - other operating expenses + other operating income.***

The second indicator is R&D intensity[11]. This is also figured and can be traced by breaking down a company's income statements. This can be useful to empirically examine whether an organization focuses on the development of 'new', 'novel' products. This has been employed in evaluation of such

[9] It refers to an active-based costing system that entails from pre-production, such as design and research and development, to the post-production phase (i.e., total life -cycle costing). R&D costs or those intangibles, including design activities, are required to be explicitly written off in cases where these intangibles are feasibly and reliably measured (Scott, 2012,p. 264).

[10] **Operating profit** refers to the profit deriving from the operation of the basic business process, then this is calculated by deducting the other operating expenses that have been incurred in operating the business from the gross profit (McLaney & Atrill, 2010; Davis, et al., 1997; Brockington, 1993).

[11] **R&D intensity**: the figures infers to nominalization of R&D by firm sales: the return per unit of R&D effort.
This model has been used by economists and R&D management scholars broadly in order to investigate how an organization's adaptive market situations (pricing and market demanding reflected in commercialised new products) affect their R&D effort for new product development (Cohen & Levinthal., 1990)

an organizational absorptive capacity, regarding the quantified technology level and organizational sensitivities to the market, reflected in product and service prices in scholarly literature on innovation and R&D and technology management (see also Cohen & Levinthal., 1990).

- ***R&D intensity (%) = R&D expense (included in operating expenses)/ sales (turnover) x 100***

The above indicators will help to examine the relationship between enacted organizational cultures and those perceptual controlling factors in design practices (further analyzed in section 5.3).

(2) Manifestation of the concerns on the perceptual controlling factors

Emergent concerns of organizations, as detailed above in design practices, are manifested in design outcomes as related to differing inquiries to either product line variations or requiring project time spans (i.e., deadline of a project). Despite increasing discussions on generative design practices, such traditional principles are unlikely to be ignored in new digital product and service design.

"At my current Asian company* it expects to achieve results in half the time available due to the lack of proper planning and overall strategy."

[DN_2; see also JT_6; WH_5]

"Japanese companies used to be using us as not so as slaves, but the people under them. We had a console and TV (projects) to make variations for it within three months by coming up with WOW ideas within the period. They wanted to see quantity rather than quality."

[TK_11]

*** a South Korean electronics company**

This all infers that the traditional principle of the NPD process - a relationship between time, resources and following product variations - is still a major concern for exploitation of organizations in actual design practices.

5.2.2.3.3. Conceptual brevities in exploitative design practices

In design practices, actual decisions on design are made with the consideration of turbulence of perceptual controlling factors, yet, this is manifested in designers' conceptual brevities in their attention structure: the decision-making process. But this is not seen as fully structured and systemized (see also Section 2.3.2.3 & Table 5. 2 in Section 5.1.4); i.e. characterized by key decision makers' obscure and iterative brevities to their subordinates in unstructured, fuzzy, and puzzling methods.

"It is not dependent on companies, but is dependent on personality. The person who chooses it, someone who drops in here even and says 'I like overall ideas…if the sketch looks nice'. Even drawing it in nice way, they just pick it up. Some of them probably have more experience. If they pick up small things, even though it is small, they see some potential in it."

[WH_6; see also SW_6]

However, conceptual brevity takes place in certain power structures (formal and informal) of an organization, causing differing approaches to managing design in actual design projects (note also (2) in Section 5.2.2.2). The powers that exist in the attention structure are, however, far more prioritized to look to mathematical and perceivable evidence for ensuring their rationales.

"There are several proposals delivered by a product planning team or the relevant departments. The drafts include specific and critical points that they want to present. For instance, when engineers ask for something they need with their advanced technology achievements (specification), it tends to be easily accepted without any filtering from us."

[JH_14; also WH_7]

In relation to this, this study found concerns about scarce attention along with the implicit power structure. A stronger power structure that is coupled with collectivism and higher power distance can possibly commit a greater lack of attention when carrying out less feasible design practices to introduce something new, since all members do not necessarily pay attention to infeasible design processes. Only a few of the top managers deal with the significant decisions and this can cause the loss of a new opportunity because of uncertainties and it also leads to significant information manipulation committed by middle level managers for their personal political maneuvering. This is found in the East Asian organizations as the following shows:

"Group decisions are like no one want to take responsibility. I think it's better if one person takes the responsibility. I think organizing the way in management wisely is very important. We need to think more about what we say because previously, although they still kept on saying you need to do it this way and then paying to ask to say that, they tended to forget and tended to watch what they felt comfortable to do."

[WH_8; see also about Korean companies in SY_5]

"But, sometimes, depending on a situation, a deputy manager can be right. But a director just gives him a licking. Yeah… if a director says, "you are wrong!" it may not be wrong because, in terms of probability, the director has more experience, so it means there is a higher probability of a director's side (being right) than the deputy manager's one."

[JC_12]

Accordingly, organizations that feature stronger power structures can lead to organizational negligence; authority is concentrated among a few in top management and so key decision-making is unlikely to be agile, thus causing a lack of passion at the subordinate members' level (see also Scott, 1998).

For instance, there are those superiors who repeatedly request more obvious rationales to ensure their presence; this involves multiple variations of design concepts to minimize criticism from other members and superiors. The East Asian-based organizations are seen to be those with complicated attention structures owing to multiple layers of hierarchies within higher power distances and collectivism.

"It is usually once. Someone in a meeting usually reports it to the top guy. Always, the work is in translation. If the project is important and a big guy is sitting in the meeting, it is the best way of doing the decision-making process. Previously, there used to be a lot of going forwards and backwards during stage process one."

[WH_9; also JC_13]

All above implications are summarized in Table (5.7.)

Attention Structure and Exploitative Information Transferring		Concerns & Considerations
Information System		• Delivering high profile information, requesting rationality-based formalization • Emerging heterogeneity of knowledge from diverse professions • Limited in conveying explicit information: challenges to compromise tacit understanding between heterogeneous profession in exchanging knowledge
Attention Structure	Concerns about exploitation	• Concerns about explicit benefit for exploitation: perceptual controlling factors – allocation of resources (direct and indirect costs); effective timeline management
	Conceptual brevity in action	• Conceptual brevity along with exploitative power structure; • Attention to exploitation, rather than exploration leading to scarce attention • Manipulation of information in a complicated exploitative power structure
	Manifestation of exploitation	• A variety of product line and tight project timelines

Table 5.7 Concerns and considerations in the attention structure in design practices

5.2.3. Overview

This section discussed the detailed mechanism of enacted organizational cultures in actual design practices; how design priorities can be manifested differently in organizational contexts and cultures.

It is found that in design practices, organizational cultures are not only enacted by a single feature of concepts of organizational cultures, such as material-based organizational cultures, cross-cultural and corporate cultures, but are also affected by symbolic and metaphoric concepts with the organizational culture as a root metaphor.

However, in actual design practices, dominant concepts of organizational cultures are rooted in material practices. For that reason, discussion of enacted organizational cultures in design practices is closely associated with the exploitation of such material mechanisms in organizations, which are characterized by an organization's domain definitions. Attention structure is concerned with the limits of perceptual controlling factors and organization structure that exists in informal and formal power structures.

Based on these findings, the next section will demonstrate how these elements can affect digital technology-embedded product and service design practices, by looking into digital platform strategies.

5.3. Finding Phase 3: Organizational Cultures in Design Outcomes

Platform Strategies as Reflected Organizational Design Outcomes

This section considers the leading high technology companies' digital platform strategies in the development of new digital products and services. This will demonstrate and illustrate how digital platform strategies can be affected by the factors drawn from the earlier findings, in terms of organizational cultures in the East and West (Note 'C' in Fig.5.1, presented in Section 5.1).
The central consideration of this section is that there have been confusions between product and platform strategy in approaches to managing new product and service design run by large global technology companies. This can be the indicator to examine whether an organization manages design in holistic or reductive approaches, as it is related to its enacted organizational culture.
This will be examined with findings drawn from cases that were explicitly discussed in the earlier primary data, i.e. Samsung, Sony, Apple and Google.

5.3.1. Digital Platforms for Holistic Product and Service Design

Explicit challenges in new digital product and service development

Development of a digital platform strategy for holistic design is confronted with dilemmatic challenges related to: (1) managing explicit commercial achievement and scalability; (2) viability to present technical solutions; and (3) tacitly emerging long-term oriented vision in organizations (see also Section 2.4.5.3). In short, it is all related to the exploitation of actual organizations in design practices, which comes from the nature of complex organizations (Figure 5.13).

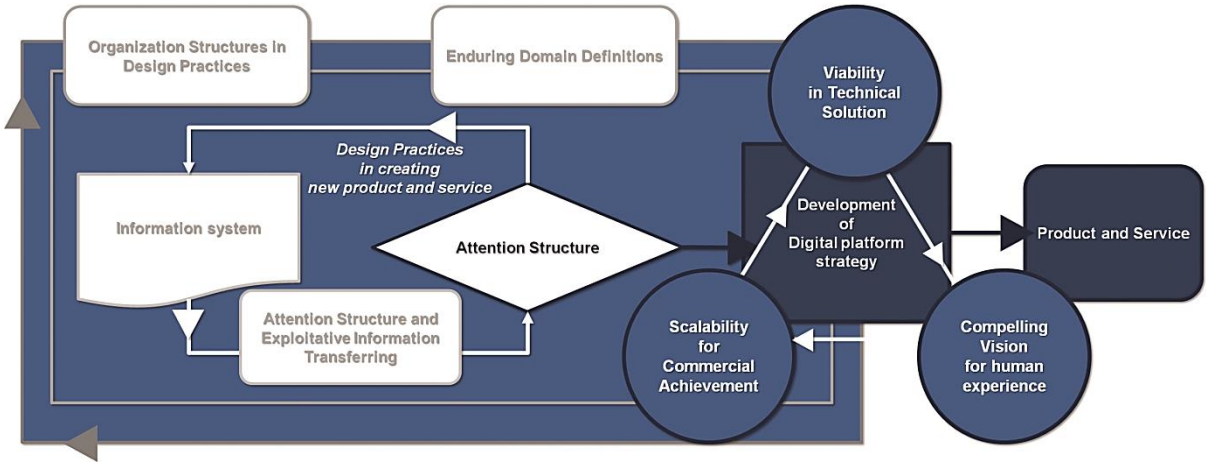


Figure 5.13 Challenges to achieve holistic product design in the development of platform strategy

- **Viability**: a digital platform strategy is in general underlined to present viable technological solutions. This is, however, achieved by disclosing a firm's own sensitive intellectual properties to other platform complements in their development process and by doing so, the roles and meanings of the platform complements are openly interchangeable from component to the product itself in a race of competitive partnership (see Section 2.4.5.2; also Adomavicius, et al., 2008; Gawer & Cusumano, 2008).However, in disclosing the intellectual property for one's own viable solution is a challenge due to the sensitive nature of one's intellectual property. For that reason, the focus of organizations is on the measureable and predictable risks within their own considerations regarding explicit benefits.

> **I think two are separated. Open innovation can mean many things. OK? There are lots of jargons in innovation. So meaning one for open innovation is…if you create something to share in Internet and…fine…people do that. I think that is their business. But most of companies inter-monitinized IP and…if you are sitting at home, and you got free time and you want to create something to post it. Great. But, if you are company? And you figure out what you are going to do in two years and hire someone to do that? That needs to be a top secret of intelligence, right? Then, you need to be cost. So…then…there is secret and privately owned vs. open. And then…you just say…that… there is innovation around closed platform and open platform. Ok? That's different, commercial openness and technical openness. So you need to be clear about which one you mean. Assuming you mean technical…technology open…then…yeah!! It's all about …needing developers? I think that…the era of big heavy closed platforms …even the big open platform are…**
>
> **[EG_6; also GF_15]**

- **Scalability**: for maximized commercial achievement, platform strategy development is initiated by the principle of design rules that imply to scalability; to reuse and create systems and structures, based on the basic level of an artefact, e.g., transistors (see also Baldwin & Clark, 2000, p.82). This principle leads to strategic demands that adequate digital platform strategy implies demands to generate scalable and expandable outcomes at a platform level for exploitative achievement. Here, the size of an organization represents the capability to achieve the scalable design outcomes with an adequate platform strategy. For instance, large organizations, such as Microsoft and Samsung, have shown their organizational capabilities in this (Gawer & Cusumano, 2008, p.35); whereas small-medium sized companies, for instance, GoPro[12], LINE and KakaoTalk, are likely to be characterized as

> **"First of all, maybe large corporations can be sustained anyway, even if an open innovation era comes to. With such technology, 3D printing is perhaps the most suitable for small quantity batch production. In terms of semi-conductor designs as fundamental components for open platforms anyway, the roles of that should be expanded and increased. For instance, even if such 3D printing technology is reliable to a certain extent, semi-conductor design is not able to be easily accomplished by this technology."**
>
> **[JS_7; see also MR_14; EG_6]**

[12] **GoPro, Inc.**, a developer of cameras, mounts, and accessories: the Company's business is engaged in developing hardware and software solutions for capturing, managing, sharing and enjoying engaging content. The company was founded by Nick Woodman, who was born in Atherton, California, a wealthy suburb in Silicon Valley, and he studied visual arts in US San Diego. As a surfer and technology geek himself, his business was inspired by poor action shots while he himself enjoyed surfing in Indonesia and Australia, after he failed in another start-up business, the marketing company called FunBag in the early 2000s. The company started doing its business by being incorporated as Woodman Labs in 2004, as GoPro. Then, it shipped its first product, a wrist-mounted, waterproof, film-based capture device in the same year. In 2006 it launched the first digital capture device, the Digital HERO; and in 2009 launched its first high-definition (HD) capture device, the HD HERO.

platform complements in a digital ecosystem (see also Table 2.9). The large size refers to the capabilities that can be provided, not only the scalable design outcomes, but also the technical capability based on their mass customization capabilities and accumulative technical capability to be able to achieve certain viable design outcomes.

> **"Products which are designed by small design consultancies have become popular and compelling in the market recently. For instance, in the case of GoPro, they created a new market. Action-cam, too. Before then, there was Flip-mino which looks like a small camcorder, which was iPhone sized."**
>
> **[JH_15; see also about LINE in VD_2; and KakaoTalk in JG_8]**

- **Compelling vision for creating human experience**: platform strategy development is underpinned by an organization's compelling vision in long-term oriented approaches, rather than exploitation of its outcomes (see also Gawer & Cusumano, 2008). However, the short-term expectation causes general organizations to only consider the existing meaning of products, rather than the platform level, e.g., they are focused on tactical missions in response to the existing environment. This leads to less consideration regarding unexpected and unintended end uses and design practices, which can be initiated from reductive perspectives.

> **"If you say that, there has been innovation for two Korean companies, Samsung and LG. Well, for example, if you think of it, when I was in LG, which is ten years ago, that must have been the efforts to move towards innovation. However, I still feel like that it is not enough. Whereas, apart from the consumer's perspective, when it comes to a consultant's perspective, that is far away from innovation. Samsung has lived as a fast follower so far. But while they have claimed in the patent lawsuits, they even have taken advantage of it. Recently, Samsung's sale volume is much larger than Apple. In terms of this, Samsung could be said to be the winner, yet it is just referred to large sales volume only. Still, it is therefore often said that in people's minds, Apple is kind of the ultimate number one."**
>
> **[JC_14; also EG_6]**

  It can be inferred that in setting a digital platform strategy, large organizations can be trapped in shorter- term oriented exploitative approaches, due to their explicitly existing concerns, such as financial achievement, risks about leakage of intellectual properties, etc. These holistic approaches to managing design in an initial phase of new product and service design seem to be limited (see also Gawer & Cusumano, 2008).

The following sections will illustrate how digital platform strategies in organizations are exploited by large tech-companies and how the approaches are confusing in design practices, as related to organizational cultures.

In 2011, GoPro was reincorporated in Delaware and acquired CineForm that can help to build capabilities in software applications. The company operates in the US, Hong Kong, Germany and China and has headquarters in San Mateo, California and it employed 869 people as on September 30, 2014. The company's revenues are recorded as $985.7 million in 2013 (FY2013); and the operating profit was $98.7 million in the same year, the increase is 84.1% over FY2012 (Brett, 2015; Shontell, 2012; Marketline, 2015).

5.3.2. Different Approaches to Digital Platform Strategies in Achieving Holistic Design

Development of Platform Strategy in influences of Cross-cultural Elements and Corporate Culture

Approaches to managing design for 'designing' can differ in a certain organizational cultures. However, the holistic approach to managing design has been less frequently discussed. To examine this, a concept of platform was adopted by defining it as organizations' design outcome. This can explain organizational cultures within dominant material practice mechanisms in design practices: cross-cultural perspectives and corporate culture perspectives (see also the Findings in Sections 5.2.1 and 5.2.2.)

5.3.2.1. Cross-cultural differences and development of digital platforms

Cross-cultural elements in material practices (analyzed in section 5.2.1.) are enacted as significant influences in forming the digital ecosystem first. There is one anecdote that describes this; when Android was acquired with Google in 2005. Before that, Andy Rubin, the founder of Android announced that Google would acquire Android; he accessed Samsung in South Korea so that it could create a mass-market with its platform. But Andy Rubin experienced the cultural differences between the organizations in generating new digital ecosystems with its platform.

"I (Rubin) walked into the boardroom with my entire team me (Rubin) and six people. Then, twenty executives walked in and stood on the other side of the table in the boardroom. We were sitting down because I wasn't accustomed to Asian culture at the time. Their CEO walks in. Everyone sits only after he sits, like a military tribunal. Then I go into pitch mode. I pitch the whole Android vision to them like they are a venture capitalist and there was silence."

(Vogelstein, 2013:P.54)

Besides the behavioural features of East and West in this story (discussed further in Section 5.3.3.4), which offers multiple angles for us to view the issue from cross-cultural perspectives, with regards to how Rubin, as one of the platform complements, was possibly rejected by Samsung at that time, including open vs. closed ground in East and West in material systems and supportive environments for openness at the national level.

"One thing that we noted is (in South Korea) working with only one agency is not allowed. In terms of organization, it is mostly huge companies and so all roles are distributed separately, although they say there is integration and integration. The reality is that there are unfair trading in terms of the legal system of Korea as companies are mostly very large organizations*."

[SY_6]

In case of start-up business, there are no genuine star-up businesses at all in Korea. However, in case of the Western start-up business, there are supporting systems such as angel investment and so on, which the investment is only looking forwards to an opportunity. However, there have been no such cases in Korea yet at all.

[JC_2]

First, the East Asian organizations have been rigidly grounded in more closed ecosystems compared to the Western organizations. Leading East Asian markets, including China, Korea and Japan, are seen as a more closed ecosystem. Solid and closed national industrial ecosystems inhibit 'openness'

and this is also revealed in their actual digital landscapes: a lack of information transparency in China; an insufficient supportive trading and financial system that forms an open ecosystem in Korea[13]; and a strong domestic market unique to Japan.

In fact, statistical figures also show how a nation is seen as closed or open, in terms of its industry ecosystem: the global entrepreneurship index (GEI)[14] (Ács et al., 2015) (Fig. 5.14). Digital platforms, such as Smartphones and software service systems (Android and iTunes, etc.) are driven by decentralized digital ecosystems; and horizontal technology development has contributed to the increase in a wide range of heterogeneous types of businesses in a digital ecosystem, for instance;, a taxi hauling service, Uber; and in Smartphone platforms based in Silicon Valley, USA (The Economist, 2015).

"This is a really big problem and a really big issue. One thing is the psychological distance that they have from the rest of the world, as well as physical distances that they have. The Japanese market is so unique that they will be ok not to care about other markets. If you want to sell a product to the Japanese, you should keep going on within that process. It is rare, relevant to the sharing platform that you say."

[TK_6]

However, the figures on GEI can show how a country's national ecosystem creates new businesses for digital ecosystems and is positively encouraged and genuinely supported by the governmental system, by being supported by its entire social governance and being sheltered from destructive and unproductive entrepreneurship in a certain economic achievement level.

However, as several participants stated above, the East Asian countries' index on national entrepreneurial systems – China (and Hong Kong), Japan, and South Korea – are significantly lower than the Western countries –US, Canada, and UK (Fig. 5.14).

"Particularly in China, information and knowledge are very much harder to combine. That's a very high priority. They cannot easily receive knowledge because communication is more closely controlled by the government with limited access to different websites".

[MR_15]

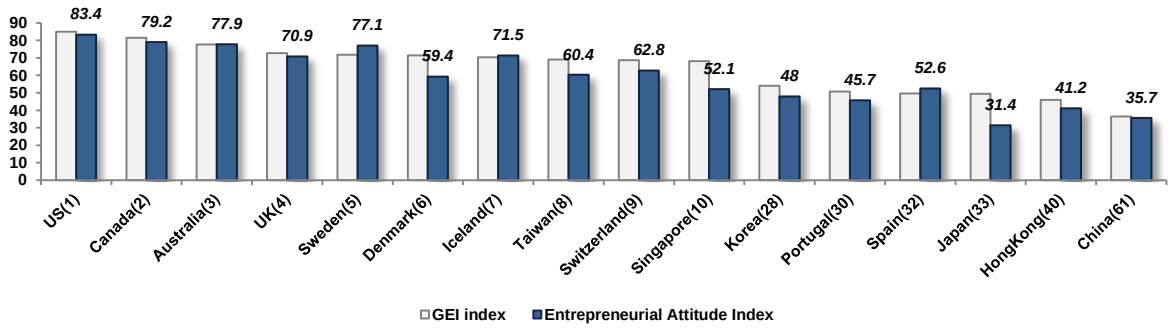
In the **attitudinal pillar** (see also footnote 15) in these East Asian countries, hindrance factors that affect the formation of an open digital industry ecosystem are clearly shown to be higher. The lower level of **networking** index figured in China (0.59); knowledge is rarely shared amongst the people because of the country's political regime, which is run by communist party committees; with limited access to global websites for collaboration; and the absence of academic freedom (see also The Economist, 2015; p.10). In Korea and Japan, the

[13] * The interviewee, SY talked about the fair trade act in South Korea. The act has been enacted to promote fair and free competition between enterprisers. But the interviewee argues that this law ironically inhibits small-medium sized companies to trade with large companies, consistently. (see also about the fair trade act in http://eng.ftc.go.kr/)

[14] GEI is evaluated by combining with three entrepreneurial pillars: (1) Attitudes - opportunity perception, start-up skills, risk acceptance, networking, cultural supports; (2) Ability - opportunity start-up, technology absorption, human capital, competition; (3) Aspiration: product innovation; process innovation; high growth; internationalization; risk capital.

opportunity perception that represents the potential in the domestic market is seen as much lower (0.22 and 0.2, respectively) than the US, Canada and the UK (1, 1, and 0.69, respectively).

Also the risk acceptance index is shown to be far lower than the Western countries. This represents the level of start-up firms' fears in launching their businesses, with regards to ability and reliability of corporate financial information, and legal credit and institutional support of intercompany transactions. The index is shown to be far lower than the Western ones, as the interviewees stated: Korea (0.62), Japan (0.68), and China (0.27) vs. US (0.71), Canada (0.67), and UK (0.71).



Global Entrepreneurship Index, ( ) referring to global rank (Ács et al., 2015)

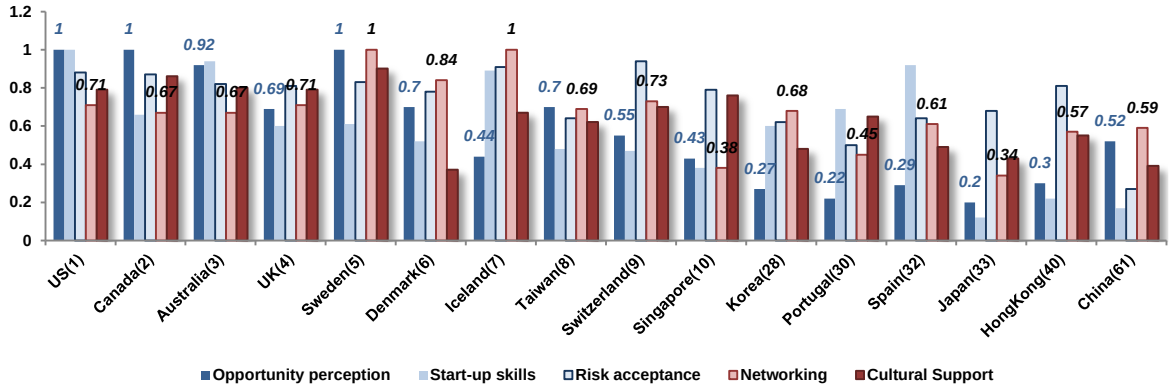


Figure 5.14 Entrepreneurship Attitude Pillars in Global Entrepreneurship Index

( ) referring to global rank (Ács et al., 2015)

"This is one of the hardest things for the Western companies to adjust to. In fact, it's just hard for Western brands to cooperate with the fact that it took the Japanese ten years to learn how to make cars better than them. You know, Koreans, learn even faster, they are really excellent.

[EG_4]

"If you go back to the 50s or 60s, Japan was the cheapest of the manufacturers*. Then, that moved into Taiwan and China. Japan is not now the cheapest, because of the controls in effect."

[VD_7; also about Japan in TK_6]

***This fact will be demonstrated in Section 5.3.3.1 on domain legacy**

Accordingly, these East Asian countries are characterized as having strong alliances between a large, powerful manufacturing industry and the national economic policy for incremental economic growth. This has been achieved along with exploitative approaches for hardware manufacturing, with few exploratory approaches, compared to the West, as stated below (see also The Economist, 2010).

The exploitative approach, along with the growth of machinery in manufacturing, is also seen in the statistical data published by the United Nations Statistics Division (Mellows-Facer & Maer, 2012; Rhodes, 2014). The East Asian countries – China, Japan and South Korea - valued manufacturing sectors for national economic growth after the post war era; the percentages of total manufacturing value added, particularly in China and South Korea, were overwhelmingly higher than the Western countries between 1970 and 2010, which reached over 30% in 2010, in comparison with ranges of the Western countries from 10% to 20% (Figure 5.15). Accordingly, when looking at the figures on manufacturing outputs by those nations (Figure 5.16), contributions of the manufacturing sectors in the East Asian countries are compelling, not only in the world manufacturing sectors, but also in those countries' national economic effects. Manufacturing contributions to those countries' economic achievements - South Korea (31%), Japan (19%), and China (31%) in national output, are far more significant than in the Western countries, US (12%) and UK (10%).

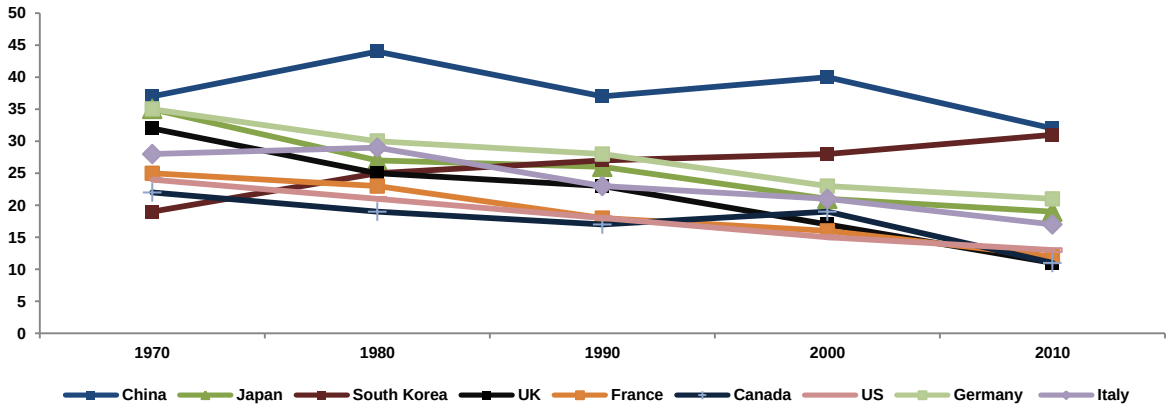
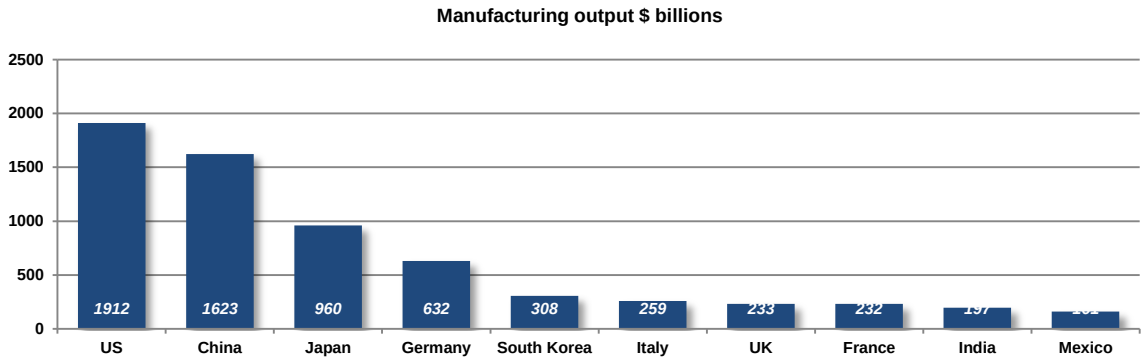


Figure 5.15 % Total manufacturing value added from 1970 to 2010 by nations

(adapted from Mellows-Facer & Maer, 2012)



The World Top 10 Countries in Manufacturing Outputs $ billions in 2012 **(Rhodes, 2014)**

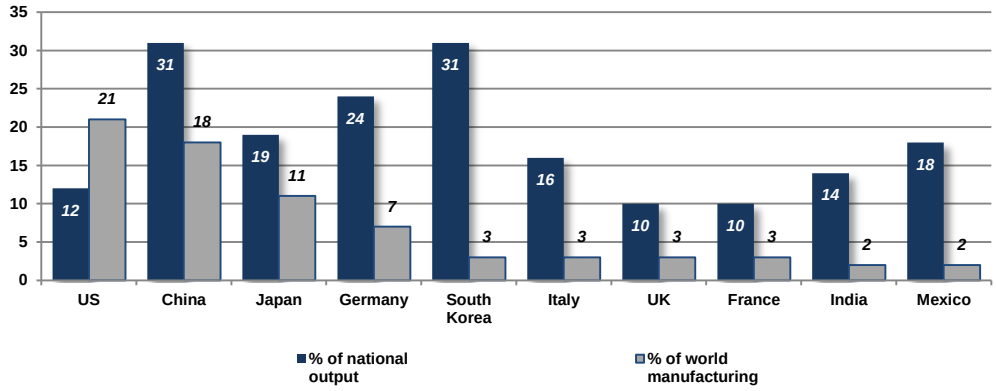


Figure 5.16 The world's top 10 manufacturing output countries' % of national output and % of world manufacturing **(Rhodes, 2014)**

It indicates that, in terms of building digital ecosystems, large East Asian organizations have focused on achieving explicit benefits in the shorter term for exploitation, along with hardware manufacturing.

5.3.2.2. Cascaded corporate cultures in the development of platform strategy

The above features in the East and West are reflected in their representative companies' cases, such as in East Asia – Samsung, LG (South Korea), Sony (Japan), HTC (Taiwan); and the West – Apple and Google (US). The findings of the empirical data show the characteristics that are revealed in those cases' platform strategies.

Reminding us of elements of corporate culture (Section 5.2.1.2.), an understanding of top management's view of holistic design is significant in developing platform strategy as related to the complexities of digital platforms and of the organization structure.

5.3.2.2.1. Absorptive capacity of leaders

First, tacitly accumulated absorptive capacities in top management are vital to capture the moment that can shift from uncertainties to opportunity in the competitive landscape of digital innovation. It is important for the organization's leader to have strong vision from a holistic perspective. The vision towards product and service is not solely derived from rationality to maintain its competitiveness, but rather, the thing is characterized by metaphoric and symbolic properties on the actual design inquires in their minds.

"I think future trends are going to be an open platform. For Apple, for example, it's all because of Steve Jobs. […] For those products if there is one strong guy to develop this idea, to carry it out and to implement it into the product under his the visionary ideas, then you can get very successful companies …and then you can get a successful business. He is exactly the type of guy that is completely obeyed…"

[WH_4]

"Many R&D institutions, Samsung, LG and so on, can make iPhones and realise the electrostatic touch screen and so on. It's not about what they cannot make it. But they do not bet it out of so many technologies. Although Samsung can do that in many respects, yet Samsung may not bet those things (new technology or newness of design). They might prefer to play it safe?"

[JC_15; also JH_16]

Second, however, the absorptive capacity of the leader/ top management is dependent upon their experiences about relevant design practices (see also (3) in Section 5.2.1.2.). Since the development of the digital platform is considered regarding multiple heterogeneous elements of its materiality (the material and immaterial), the leader's capacity to understand all this heterogeneity is vital from a holistic perspective. Yet, the leader's mind-set and tacit understanding on new technological and social trends and background (career path, profession, education, etc.) are significant attributes that can give rise to different levels of understanding of those heterogeneities and diversities to form a digital platform with their products and services. For instance, leaders from the 'old generation' leading South Korean companies (LG and Samsung), who are educated and experienced in a limited range of design practices, can inhibit the assimilation of a whole heterogeneous design capacity into one digital platform due to their lack of understanding. Regardless of regional features, however, the leaders in Apple and Google are grounded in a field of computing (US) and the founders who studied products and engineering in HTC (Taiwan) show their capacities to approach holistic design (see also section 5.2.1.2.3; and A.3.1 in appendices for profiles of executive members of Samsung, Sony, Apple, and Google).

"Recently, according to persons from the Samsung R&D centre and development units, most development projects have still been driven by elderly Korean executive members."

[JC_16; also about Korean companies in GF_16]

"The CEO was the founder of the company? So, they had a lot of power. Everybody respects his point of view. I think he is a mechanical engineer. So he had a lot of appreciation for the product design and designing them. It was a direct command or requests on his side to elevate design and the design culture of HTC. That cascades to the whole organization, because the CEO was protecting the design organization from the rest of the company. Design was able to help to differentiate the products of HTC."

[JG_3]

5.3.2.2.2. Leadership in action in organization structure

Organization structure (normative and behavioural) is another concern in establishing a digital platform for holistic design with its product and service properties. In complex conditions of digital technology, organizations' administrative structures are aligned with their product and service system configuration or the design process (see Section 5.2.1.2.2; also following Figures 5.3.15 & 5.3.17 in Section 5.3.3.1). In consideration of each leader's role in charge of a product or service property, their status is not always secured; it is often unstable, dependent upon upcoming technology or competitive market situations. Their job status as leader can only be secured when their performance is conclusive in those situations with his/her competitive product and service. This causes their demands to be focused on meeting their shorter-term oriented expectations during their term in office. However, the expectation is shown to be relatively higher and the role is more demanding when a leader is placed under pressure from multiple observers within a tightly-coupled organization structure: i.e., higher collectivism and larger power distances. The features are shown particularly in the East Asian organizations; a couple of South Korean electronics companies and the former CEO of Sony, Ryoji Chubachi[15] in Japan (Section 5.1.2; Section 5.2.2.2).

[15] **Dr. Ryoji Chubachi, Ph.D.,** served as Chief Executive Officer of Sony Electronics Inc. As the interviewee, VD stated, he stepped down as President in April 2009, as Sony hoped to renew its leadership due to its economic woes during his term. This was mainly caused by Sony's electronics division's defeat to its global rivals, Samsung and Apple in 2009 (see also SEC.5.3.3.3.1). At that time, he oversaw the core electronics sector, and was one of Japan's most famous manufacturers. He was assigned as the president of Sony Corporation from 2005, when the Welsh-born American, Howard Stringer, became the first foreigner to head Sony. Stringer had stayed on as chairman and chief executive until February 1, 2012, adding the presidency as another title after Chubachi stepped down in April 1 2009. He served as Representative Corporate Executive Officer of Sony Corporation until March 31, 2013, overseeing quality, safety and environmental policies. Before he became President of Sony Corp., he had served as President of the Sony Display Device Development Group since October 1, 2005. He served in a number of positions since joining Sony in 1977 (BloombergBusiness, 2015; CBSNEWS, 2009)

"The reason for that is that, I know that there were not changes in the executive members' terms. The top management, the owners, the CEO, or the vice president, probably pushed at the bottom to ask, 'why can't we do this like the competitors?!' So, they can be close to the competitors' products, yet it is not easy to overcome them. They should make outstanding performances within a maximum of 4 years, or mostly in between 2 and 3 years. All performances should be made within the limited period. Well, so that is to be said as limitations of them because they are not allowed to research something with a focus on long-term planning to defeat their other competitors."

[JC_17; also about a Korean company in JH_17]

"They kind of go wrong because the person who is the head takes the blame for everything, because he is a leader. I didn't know it's seen like that. It's an experience. One good experience, 'Chubachi' stepped down from a subsidiary CEO of Sony. It's a very hierarchical world."

[VD_9]

Within this context, corporate culture is, to some extent interplayed with cross-cultural aspects in the development of digital platforms. In the above East Asian organizations, explicit higher collectivism and larger power distances lead the leaders and organizations to exploitative approaches, focusing on their explicit benefits in reductive methods.

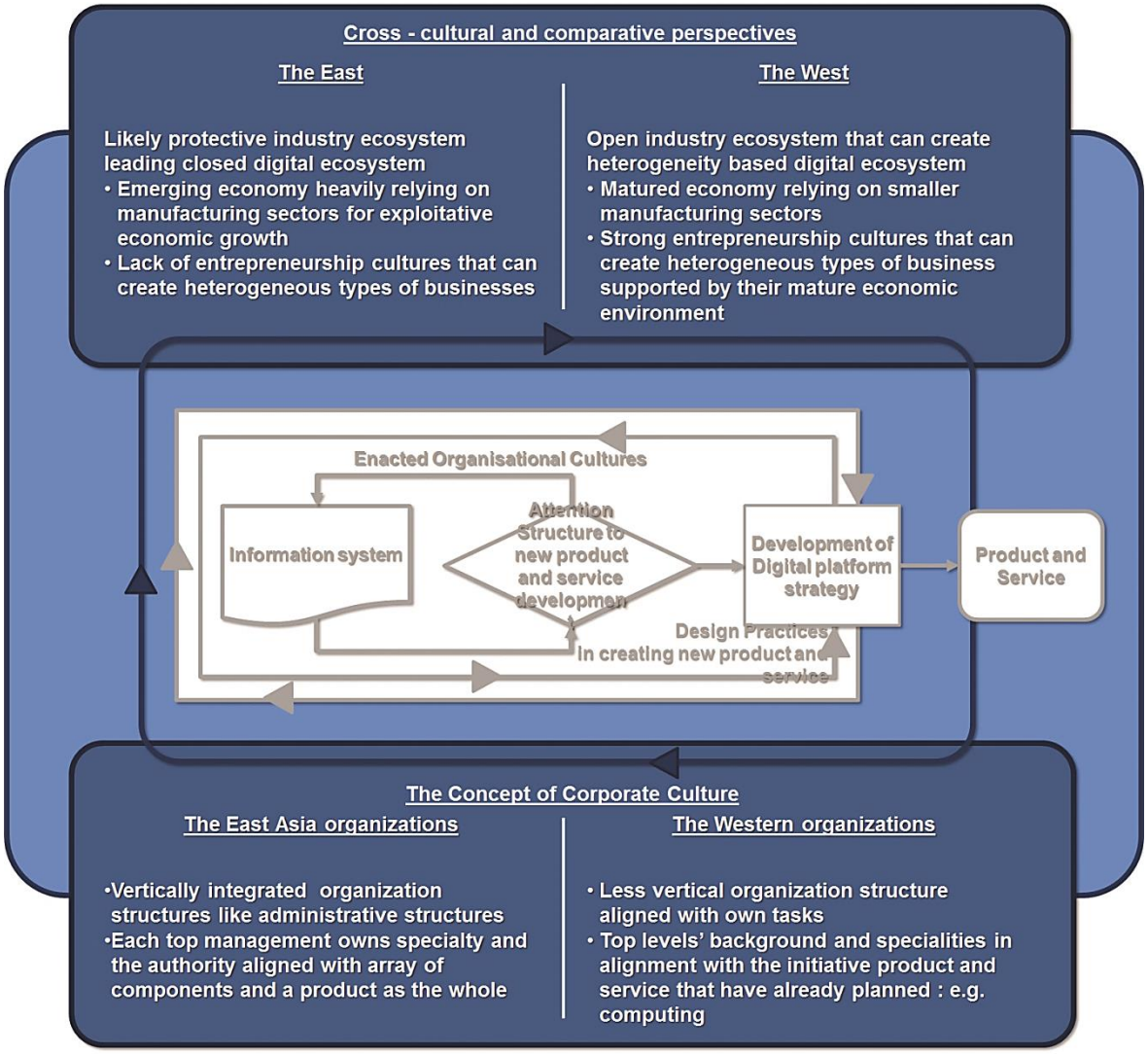


Figure 5.17 Material-based organizational cultures and the features that can affect digital platform strategy in the East and West

5.3.3. Designing Digital Platform Strategy: From Perspectives of the East and West

5.3.3.1. Domain definition and absorptive capacity: hardly shifting from here to there

The following sections will examine how enacted organizational cultures are projected in organizational capacities for development of digital platform strategy. To do so, this study selected the exemplar cases in the East: Samsung and Sony, and in the West: Apple and Google. The cases are frequently commented as issues raised from the cases have been significant in shaping a digital ecosystem. It is to be initially illustrated along the following dimensions:

(1) Domain Legacies and the Inertia (Section 5.3.3.1.1)

(2) Absorptive capacities projected in organization structure (Section 5.3.3.1.2)

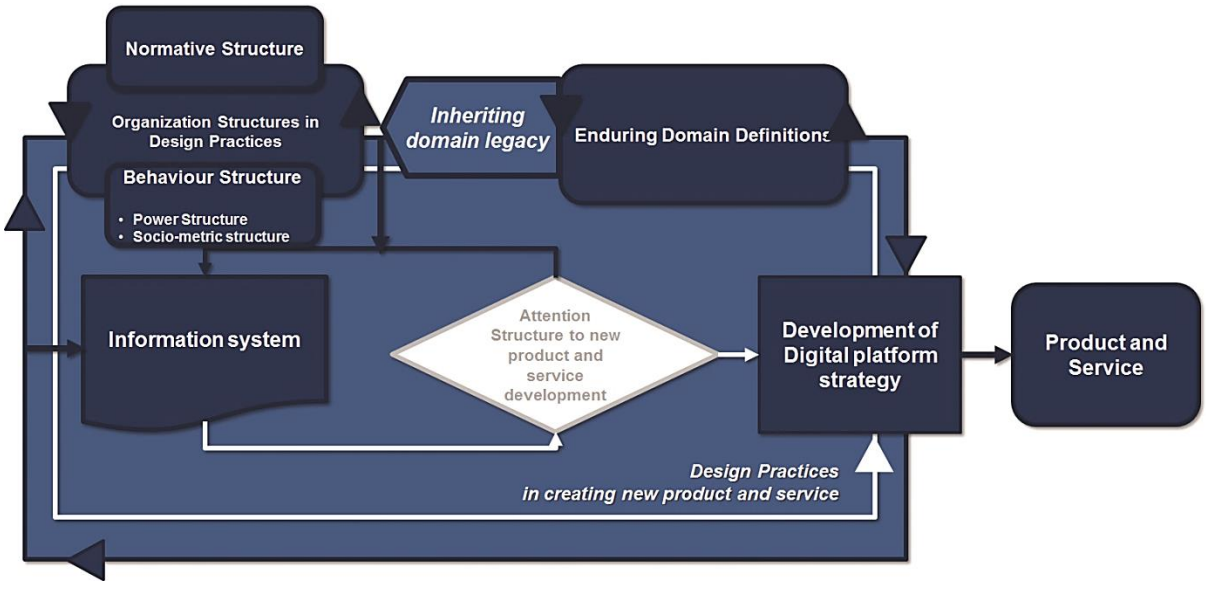


Figure 5.18 Diagram of enacted organizational cultures in digital platform strategy

5.3.3.1.1. Domain legacies and the inertia: hardware in the East vs. software in the West

In consideration of a company's initial domain definition, Japanese technology leader, Sony Electronics and South Korean electronics giants, Samsung Electronics were founded on hardware development. Whereas, Apple and Google were started as small start-up companies in the birthplace

of digitalization[16], Silicon Valley, USA, characterized by autonomy and pioneering outlook. The brief histories of those companies, regarding their domains are depicted as follows.

(1) Sony and Samsung: The Best Way to Grow up, Diversification with Hardware Manufacturing

Sony

Sony in Japan was the king of audio and video (AV). Ibuka Masaru, who developed various electronic devices during World War II, founded the company and Akio Morita was hired as a manager in 1946 and worked in a small rental office in Tokyo; just a year after Japan's defeat in the war. The company was incorporated with the Tokyo Telecommunication Engineering Corporation, which had manufactured vacuum tube voltmeters, communication devices, electric rice cookers and electric floorboards. As it was manufacturing all kinds of electronic products, Sony, as the incorporated company, eventually developed a tape recorder in 1950, which was not aimed directly at consumers, but designed for schools and governments. By purchasing the patent rights for a US developed transistor in 1955, the company finally launched the first transistor radio in the US and this helped them to grow quickly with the Sony Brand. However, around that time, Sony was not the genuine inventor of the product. Despite commercial and technical success at that time, the aim of Sony in developing new products was based on 'learning things that have already existed' in the market and technology. It focused more on taking on proprietary technology. The first commercially successful product, wire recorders, already existed and Sony's two founders, Ibuka and Morita, saw the product that had been made for the US military, and tried to learn how to make it with only a vague idea about how to do so. They persisted with numerous trial and error experiments until they launched it on to the market. Their other commercially successful product, the Sony transistor radio, was licensed with patent by Bell Labs and was also developed through an extreme learning process. This product already existed, yet it had failed in the market when a USA company, Regency, supported by Texas Instruments, launched it. Surprisingly, at that time, Sony's knowledge of the technology was limited to a book, Transistors Technology, which Morita had brought from the USA. So, Sony needed to learn the 'know-how[17]'.

> **"I think there is ultimately a legacy issue. Sony is coming from a point of view where it was the king! Then everything was closed. So in their approach from back in the 1960s and 1970s, Sony could control everything from Blue Ray, that final version. You know? Blue ray is a closed system, right? It's a licensing view for them."**
>
> **[VD]**

[16] The company stories are mainly outlined and analysed from the following literature:
- Ashton, (2015), How to Fly a Horse: The Secret History of Creation, Invention, and Discovery
- Isaacson, (2011) Steve Jobs
- Levy, (2011), In The Plex: How Google Thinks, Works and Shapes Our Lives
- Vogelstein (2013), Dogfight: How Apple and Google went to war and started a revolution
- Chang, (2009), Sony vs. Smasung : The inside story of the electronics giants' battle for global supremacy
- Schmidt & Rosenberg(2014), How Google Works: 'Fascinating and full of food for tought' Success

[17] See footnote 20 on the meaning of 'know-how'; 'know-why'; and 'know-what' on page 292 (also Sanchez, 1996).

The founders sent an engineer, Kazuo Iwama, to the US factory and asked him to send key information about the manufacturing machines by sketching and drawing all key information in the US factory and, eventually, the transistor radio project was made.

After this success, Sony achieved a series of successes in technology and the market, based on learning the know-how of processes. It developed Trinitron technology that was based on an accidental discovery that the transmissibility of electronic rays increased. This became the foundation for the high quality of colour television displays, such as the Cathode Ray Tube (CRT) TV in the 1960s. In 1979, eventually, Sony introduced the Sony Walkman, a compact cassette tape player that was another version of the stereo recorder, which removed the recording circuit and speakers and replaced them with a stereo amplifier (the first version was launched with only an earphone jack and a replay button). Through the success that followed, Sony was able to rule as king of video and audio technology by creating a new market. This tells us that, historically, this company had high quality hardware manufacturing and good commercialization of all these products, such as: home video tape recorders (VTRs); compact camcorders (CCDs) (charge-coupled devices); digital video discs (DVDs); mini-discs; flat CRT TVs, digital cameras; and so on.

Samsung

"Samsung was born in a different place and a different time. In fact, the "brand Samsung" is different again. Samsung was an OEM that developed its brand to become more profitable and successful. Its purpose wasn't to change the world, but to drive the wealth of its shareholders and perhaps of the nation."

[GF]

In this company, designers are not really desperate, but often they say, "Our scope is only up to here!" The reason for that is, "we are the manufacturer!" often the designers said. They said that this company is the one that does the manufacture for mass production, not the ones that create new vision or something else like Google's style. The designers themselves think of themselves in this way. In fact, it is true. We have done the manufacturing."

[JH]

The other East Asian Electronics giant, Samsung from South Korea, has a slightly different business history from Sony. However, both have a common area, in terms of the core business area that helped them to grow as giants; diversification of hardware manufacturing. Samsung Electronics did not start their business with any real empathy towards technology nor towards visions for their consumers. Just as Sony had incorporated with the Tokyo Telecommunication Engineering Corporation, Samsung Electronics was started as a subsidiary of the Samsung Group in January 1969.

The Samsung Group company had little to do with manufacturing electronics gadgets at all, looking at the story of foundation. The company was established in 1938 as a trading company for a small noodle business by the founder, Lee Byung-chul, in Japanese colonized Korea (Chang, 2009). The founder was educated in Japan and launched his business in a Japanese colony, Korea, so the company was strongly rooted in Japanese ways. Its main corporate strength; consumer electronics,

memory chips and LCD panels etc., are products in which all Japanese firms once led the way and all of them are hardware products and components (Khanna et al., 2011).

This company has rapidly grown by diversifying into foods, textiles, financial services, petrochemicals, shipbuilding, heavy equipment and aerospace, and, in 2011, it had up to 83 subsidiaries. It is strictly controlled by family members at the top, so that it is particularly hierarchical; it prizes market share over profits and has an opaque and confusing ownership structure under a 'complex web of cross shareholdings' between 'family members' (The Economist, 2010; The Economist, 2011; The Economist, 2015: see Figure 5.19).

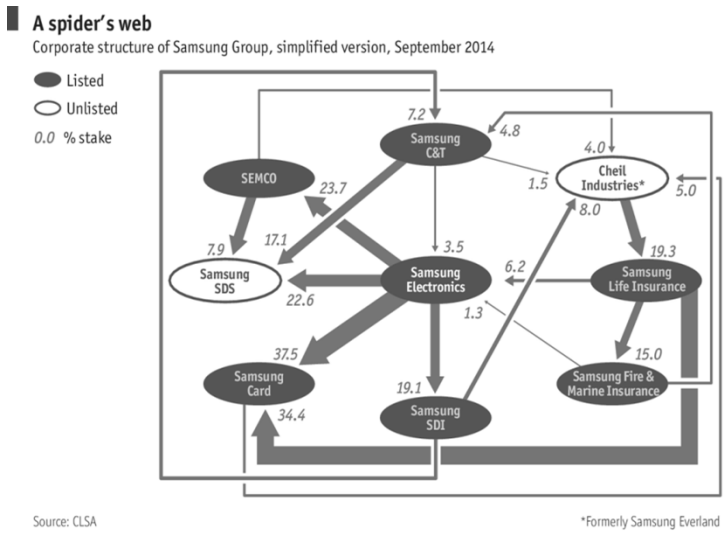


Figure 5.19 Ownership Structure of Samsung Group and Samsung Electronics

(The Economist, 2015)

In South Korea, the family members' images are even seen as the company's public face. Accordingly, in the Korean news media its successful or prospective product names, such as mobile phones, have been used synonymously with its leaders' names. For instance, the SGH-T100, was the Lee Kun-hee phone (the founder's son and successor) in 2002; and in 2015, the Galaxy S6, was the Lee Jea-yong phone (Lee Kun-hee's son and successor) (The Economist, 2015).

Samsung Electronics is currently selling products from semiconductor chips to smartphones and has grown up as part of the diversification into the electronics business as a flagship of the 83 constituent parts of the Samsung Empire (The Economist, 2011; The Economist, 2011). In 2015, the company generated two-thirds of the group's revenues, more than $300 billion annually and is the world's largest electronics manufacturer.

However, in terms of its design capacities, Samsung Electronics started poorly by producing an outdated black-and-white TV in 1970. Following that, it produced refrigerators, washing machines, colour TVs, computer monitors and microwaves, all of which are categorized as lower-tech offerings.

Due to the fragile and vulnerable background of its absorbed technology, Samsung Electronics' TV business was raised by borrowing technical 'know-how', rather than through authentic 'know-what' knowledge accumulation. Samsung Electronics' first colour TV was eventually started through a Japanese manufacturer, the Matsushita (Panasonic) Electronics' technological incorporation.

The history of learning 'know-how' in Samsung is represented by its semi-conductor business, which has been a key contributor to Samsung's success as global technology giant. After launching these simply assembled electronics products, Samsung became interested in the key component business, as the company had suffered due to the oil crisis in 1973. So they felt that semiconductor supplies from Japanese companies were not secure enough to sustainably produce their product lines of refrigerators and televisions. Samsung's founder, Lee Byung-chul, established the business by acquiring a Korean semiconductor business that was almost bankrupt at the time. However, Samsung did not have much knowledge about how to produce fine and sophisticated semiconductors nor how to dominate the market at all. Like Sony's methods had done before in the development of new electronics products, Samsung's semiconductor business had become established through 'learning know-how' for commercial success. Due to the poor quality and lack of technology know-how in the 1970s, Samsung's semiconductors struggled to penetrate into existing businesses for the components to be supplied, such as the production of transistors. During that time, Samsung made a decision to increase the business by focusing on economic scales in a rather easier way. The company chose memory chips, the DRAM business that could be easily fitted into the growing information industry. In order to meet all this technology and economic stabilization, Samsung spent a huge amount at the beginning on employing talented semiconductor engineers. Secretly, the founder brought in Japanese semiconductor engineers every weekend by the late 1970s, using private helicopters from Japan to Samsung's research centre in South Korea, and they were able to transfer the knowledge and technology. In the 1980s, the DRAM business became competitive and many Korean engineers who were educated in US schools and had experience in US semiconductor firms were aggressively employed by paying them four and five times more than the regular salaries of Korean firms' presidents.

Therefore, as Sony had done before, Samsung Electronics was also said to be a company that specialized effectively in making and diversifying new products to the extent of simple assembling for economic success, from components to final goods, with learning 'know-how' or 'how to' make it. So, although the company had achieved high revenues from those product lines, until early 1990, most of Samsung Electronics' products had been limited to a range of OEM products as cheap and low quality products for the US discount stores, Sears, Wal-Mart, and Kmart. Until then, Samsung did not have adequate technology to produce high quality, profitable products.

(2) Apple and Google: Pursuit of Integration as a Whole for the Best Computing

Apple

There is a major difference between Apple and the East Asian hardware giant manufacturers, Sony and Samsung. Although this company has often been categorized as a software company, in some respects Apple must be defined as a hardware company. It has had clear visionary boundaries, at least in its own business domain, as the company has focused only on 'making the best computer' and computing systems. The company Apple was founded by the meeting of two 'Steves' in 1974 in a Homebrew Computer Club. One was Steve Jobs, who worked for video game maker, Atari, and the other was, Steve Wozniak, who was his high school friend and a few years older.

> **"Apple is a unique company; its roots lie in the counter culture revolution of the 1960's USA. Its founders were hippies who wanted to change the world in 'peace and love'... One of the key beliefs of the culture that influenced people was to create the "personal computer" - machines that would empower users, and not just help industry."**
>
> **[GF]**

Although Steve Jobs was not a computer engineer like Wozniak, their business was launched with Jobs' visionary plan and his intuitive capability on computers. As a leader, Steve Jobs, a college dropout (he dropped out of Reed College, Portland, in 1972), had attempted to reflect his diverse experience and ideas into his products and services; he has been said to be good at associating, connecting things to trigger novel ideas. His early experiences and habits were to help generate Apple's breakthrough products: he spent his early lifetime exploring new and unrelated things – the art of calligraphy, meditation practices in an Indian ashram, the fine details of a Mercedes-Benz; and even disassembling a Sony Walkman that Apple had hoped to defeat, while he incubated his business (Dyer et al., 2009; Isaacson, 2011; The Association Press, 2011).

They formed Apple Computers on April Fools' Day in 1976 in a Silicon Valley garage; just shortly after Wozniak and Jobs created a new computer circuit board. In the same year, the Apple I computer was launched and went on sale by the summer for $666.66. It contained the parts to build 50 "hobby computers" of their own design for a local computer store, called the Byte Shop. After launching the Apple I, Steve Jobs realized that the personal computer era was coming and so he decided that the next Apple computer would be: integrated from hardware, such as power supply to software; a complete package that had a good case and a built-in keyboard; and not for computer hobbyists, but for the general public who wanted to run their own computers. This personal computer was launched in San Francisco in the first West Coast Computer Fair in April 1977 and it achieved success in commerce and technology as it showed dramatic increase in sales between 1977, selling 2,500 units, and 210,000 sets in 1981.

As the East Asian companies, Sony and Samsung, did in their early stages, Apple faced the similar problem of lack of technology to accomplish what the founder wanted. Yet, the way of achieving this new technology for new products was significantly different from the East Asian companies' approach. This is well reflected in the company's 'Lisa' project at the time of shipping the new Apple III computer. The project was aimed at developing the first user-friendly computer by transforming the concept of the computer as a desktop machine into a virtual reality one using graphical user interface (GUI) technology and a new concept of a mouse that allowed the user to directly touch, manipulate, drag and relocate things on the screen in any direction, with double clicking. In order to do that, Steve Jobs, did not forcefully ask his personnel and co-founder, Steve Wozniak, to draw and sketch key information about competitors' new technology, nor did he aggressively and discreetly employ a professional who used to work at the same frontier of hardware computer engineering by paying them a highly increased salary. Instead, Steve Jobs employed Bill Atkinson, who at that time was a programmer and doctoral student in neuroscience at the University of Washington, by sending him only a non-refundable flight ticket. The most advanced technology for achieving Apple's Lisa project had already been developed by the Xerox Corporation's Palo Alto Research Centre (called Xerox PARC), with bitmapping and GUI-featured computers. They had even launched a similar product, which Apple targeted, the Xerox Star, that entered the networked office market in 1981.

However, the deal to achieve new technology between Xerox and Apple was made amidst a process of fair play, compared to the East Asian companies' methods. Steve Jobs suggested that Xerox would be allowed to invest a million dollars in Apple if Xerox opened PARC; being a response to Xerox's complex deal offer that Apple was financing would be part of the second round of Xerox's venture capital division in 1979. After the acceptance of the deal by Xerox, Jobs and Atkinson attempted to get closer to the technology that Xerox had by patiently participating in several discreet conferences that Xerox had organised. In the meantime, Apple did not even look at all the technology that Xerox showed at that time, such as computer networking and object oriented programming, but rather it focused on what they wanted to get – a bitmapped screen for a user-friendly computer for personal use.

Therefore, it was a different context from drawing, sketching and having engineers all doing the same work to simply recreate what had been made already. Due to Apple's expertise, instead of the 'clunky' Xerox computers, Apple could create a new concept of computers for people, in which all the necessary features for personal computing could be easily accomplished on screen by using only a hand and fingers, e.g., a newly designed mouse controller, in a complete computer package.

Google

"In the case of Google, we are trying to reach as many people as possible. So we try to make that design as accessible and simple as possible. The focus of the company is not simplicity just because it makes the product look better; it is simplicity because it helps people use our product. Because it requires that there is no instruction manual for our product."

[JG]

Two computer science graduate students, Sergey Brin and Larry Page, founded Google. They met in 1995 at Stanford University, which was the best place to learn cutting edge computer science, but also to pursue the thriving Internet boom at that time. The meeting between Brin and Page was something of a coincidence; Brin, who had already been at Stanford for two years, was the guide for Page's group on the university's tour for new graduate students.

Google was started with a clear vision of developing the best search platform to be universally used through the Internet and the personal computer. By the time they started with their business in 1998, the two founders hadn't had any formal business training or experience. But they considered this an advantage, and the simple principle they created for their business was just focusing on the users with great services, and the world's best search engine. For that their tactics were also simple; hiring as many talented software engineers as they could and provide them with the same freedom they had in their Stanford computer science lab: professors did not dictate what their thesis projects should be but just offered direction and suggestions; similarly, Brin and Page gave general directions to their employees in order to keep them moving in the same direction (Schmidt & Rosenberg, 2014).

However, as all other digital technology leaders had found by the time a company reached commercial and technology success, new technology and its implementation were a matter even for the Google founders. In Stanford, Page worked for the Human-Computer Interaction Group in the computer science department and was inspired in many ways by the classic book 'The Psychology of Everyday Things', written by Apple interface guru Donald Norman.

The concept of a web search engine, the search algorithm, and even the Internet, were nothing new in 1995. Search algorithms that could result in quality information retrieval (IR) (what determined the ranking of the results) was already being used, having been developed in the 1960s by Gerard Salton, a refugee from Nazi Germany. This technique was applied by a web search engine programme, from AltaVista by DEC (Digital Equipment Corporation)'s Western Research Laboratory. It was designed by a key designer, Louis Monier, who came to the USA from France for his geeky goal of computing.. However, by late 1995, despite the effective use of Monier's search engine in DEC's Western Research Lab, DEC had not yet opened the search engine to the public, as it was nothing to do with making money.

In line with this historical background of the search engine, Page and Brin's search engine project can be traced back to one of Stanford's programmes that was funded by the National Science Foundation in the early 1990s, called the Digital Library Project. Hector Garcia-Molina, who was Brin's advisor

in Stanford, cofounded this project. By 1995, when Brin and Page were involved in the programme led by Garcia Molina, the project still remained as a concept for academic purposes for using the World Wide Web. However, Page, who was looking for a dissertation topic, attempted to accomplish a new search algorithm that web links acted on like citations in a scholarly article, which, if a paper is important, other papers cited them in notes and bibliographies. So in Page's understanding, this principle could be applied to web pages for getting the right data. As he was not a talented programmer, Page sought friends to help him to accomplish his ambitious project. The relationship with Brin, who was the maths prodigy, was further developed by seeking the solution together with another assistant who was involved in the Digital Library Project, Scott Hassan who wrote a program in Python instead of Java that Page failed to use. Through starting a test by March 1996, Page's idea on using links in the web search was born, called BackRub, and had become popular in Stanford. In 1998, the two presented their discovery at the World Wide Web Conference.

After multiple trials to venture capitalists to get a license for their search engine, BackRub, Page and Brin filed for incorporation and moved off campus on September 4, 1998. The name, Google.com, finally replaced the Stanford Research Projects in December that year. By 1999 they had raised almost $30 million in funding from private investors, venture capital firms and Stanford University. Later that year the Google site was launched. Brin and Page hired technical industry veteran, Eric Schmidt (former CTO at Sun Microsystems and former CEO of Novell) in 2001 as Google's CEO.

In fact, it was clear that the beginning of the concept of 'Google' was to be found in little things to do with strong passions about achieving a successful business. It also tells us that acquiring the knowledge to create new technology was not achieved through copying, or drawing and sketching all the relevant information, or by employing human resources who had done the same thing before. Those early histories of digital leaders in the 21st Century illustrate that domain definition in the early stages of companies can play a significant central role in perceiving what a new digital product will be.

Samsung (South Korea) and Sony (Japan)	Apple and Google (US)
• The firms have grown up with a type of incorporated company system by be supported by mother groups or the companies after their national tragedies (World War II, Korean wars, 1953), aimed to contribute to the national economic growth	• The firms formed as start-up businesses by gaining reputations from market and technology in alignment with individual leaders' passions or goals, based on national economic affluences (Apple and Google in USA in the1970s and 1990s, respectively)
• Both firms grew up by learning practical know – how style knowledge	• Started from the leaders' inquiries for planned products - computing
• Domain origins were not genuinely digitalizing products	• Initiated by know-what or know–why knowledge on computing; so the origins were started with digitalising product and services – computing
• Hardware goods manufacturing expanded by exploitative diversification, optimising existing product lines for financial achievement.	• The firms have approached evolutionary artifacts, based on their given product and service – computing, rather than exploitative diversification

Table 5.8 Features in domain definitions in Eastern and Western companies

5.3.3.1.2. Absorptive capacities projected in organization structure

An organization's initial domain definition also affects the configuring of its organization structure, followed by its capacity to accumulate design capabilities in tailoring its approaches to design management in constantly evolving digital landscapes.

First, an inherited domain structure in an organization makes the company remain within its own domain definition, in tailoring its approaches to managing design, in the age of digital innovation. Despite the significance of the holistic approaches in design management for digital innovation (Yoo et al., 2010; Krippendorff, 2011), hardware manufacturers, Sony and Samsung, viewed the concept of 'designing' from a limited perspective, how to build physical hardware product sets in actual design projects. There was a lack of understanding of heterogeneous complements of service and contents software elements. Co-creating with intangible service platforms has rarely been addressed in these

"It is something that Asian companies are not that much at a disadvantage. They can put software to devices? The main disadvantage is that they have is on the side of user experience, the user interface design. There is not a proper way for Samsung or Sony or HTC, they don't make money on Cloud. They make money on devices, right?"

[JG_9]

"I think Sony is so confused because when Sony created the new music services, they thought, one of the ways was, 'why do we want to create a music service?' It's not to be a business like a music service, but also should be differentiated for hardware*!"

[VD_10; see also EG_7]
* See also about domain legacy in Section 5.3.3.1

organizations, so service and contents have been perceived as additional or peripheral things to be added to hardware product sets.

The major reasons for this are that their business models and the organization structure have been already nurtured in their own hardware manufacturing domains. In fact, most revenues for those two companies come from hardware manufacturing in either a vertically integrated structure, Samsung (see also Chang 2009; p. 57); a serially multidivisional organization structures, Sony, aligned with their own product and component properties (see Figure 5.20 about Samsung and Figure 5.22 on Sony). Their organizational culture is to some extent inherited from the organization's structures (see also Chang, 2009 and more detailed information about authorities of the structures in A.3.1 in appendices).

Second, the enduring domain definitions can also affect whether an organization captures an opportunity to become a platform leader in those digital landscapes; becoming either a 'protagonist' or an 'antagonist' (see Section 2.4.5.2; Eaton et al., 2011). In the operation of digital technology-embedded products and services, software service firms, such as Google, Amazon, Netflix etc. are interdependently played with physical devices, such as Apple's iPhone, iPad, the Samsung Galaxy series and so on, as the functional properties are constrained by the functions of the physical components in those products (see Yoo et al., 2010: p. 729). From the design perspective, a concept of digital technology-embedded products and services is not dependent solely on one element: the physical product or intangible service, but it is about how to manage its platform, such as an operating system, like iTunes. The attractiveness of a product in use is associated with how a platform offers the best experience for users (Pisano, 2015).
Yet, those software service and contents firms are extraordinarly good at tailoring their services to meet the constantly changing customers' needs by updating their offerings, based on real-time data sources on their behaviour (Reeves et al., 2015); whereas, for hardware manufacturers, it becomes difficult to constantly tailor and adapt their design methods to those software complementaries' approaches, due to linearly and vertically intergrated product design algorithms.

"When I was working at Sony or HTC, we would design our software experiences based on our hero devices, so to speak. We would design the software experiences around one…or Sony Xperia. From them we would design for the experience …were…integrated…was the lower devices Well, it was not integrated. But it was simplified, or the devices are less capable."

[JG_6; see also EG_8]

For these reasons, East Asian technology firms (Sony, Samsung and HTC, etc.) as hardware manufacturers are limited to carrying out their capabilities to become platform leaders in agile ways due to their enduring domain definitions in those competitive digital landscapes, compared to the Western firms, Google and Apple. In fact, Google and Apple have achieved their success with their protagonist software service platforms: e.g., Google's search engines and Apple's iTunes (see Figures

5.24 and 5.25). Whereas, the actual revenue of Sony and Samsung, in designing and selling hardware devices, comes from their physical products and components (Figures 5.21 and 5.23). This makes them become antagonists in the digital landscape.

Last, an organization's initial domain definition has an impact on the accumulation of its new core capacity in their design practices, as the previously accumulated design capacity constrains any response to new approaches in agile ways. This becomes inertia in the vertically integrated-hierarchical structure, product and organization (see also Hannan & Freeman, 1984: p 142; Sections 2.4.2.2. & 2.4.5.3). For hardware manufacturers such as Sony and Samsung, their accumulative capacities have been very focused on their own boundaries in developing their own core capabilities, such as facilities, equipment, talented human resources, and so on. The accumulated capacities affect the adaptation of new approaches to design management.

"Steve Jobs has based a company on the founder of Sony. Steve created iTunes. So, you know their approaches from back in the 1960s and 1970s, Sony could control everything from Blue Ray that final version. You know? Blue ray is a closed system, right? It's a licensing view for them. So, if they make a closed system, that obviously it is much better for them to control everything, like licensing, in terms of money."

[VD_10]

However, this can cause a myopic strategy in the development of digital platforms. In fact, since the launch of the first iPhone in 2007, the hardware manufacturers, Sony and Samsung, have remained focused on their own core business areas, producing hardware items (see The Economist, 2014; Yoo & Kim, 2015) because for them it could produce more profit by reducing their predictable risks (see Figures 5.29 and 5.30).

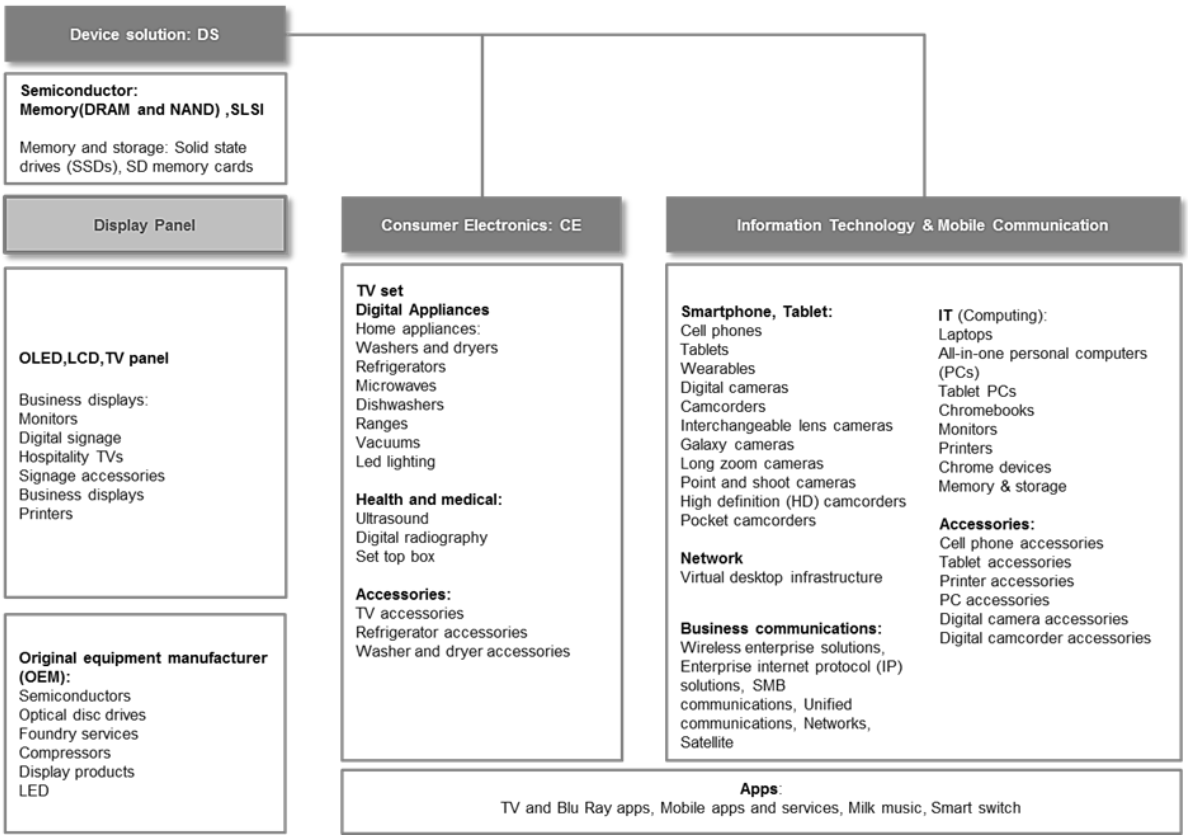


Figure 5.20 Samsung organization chart and product and services by the division (sources: the company webpage, and Marketline report, 2014)

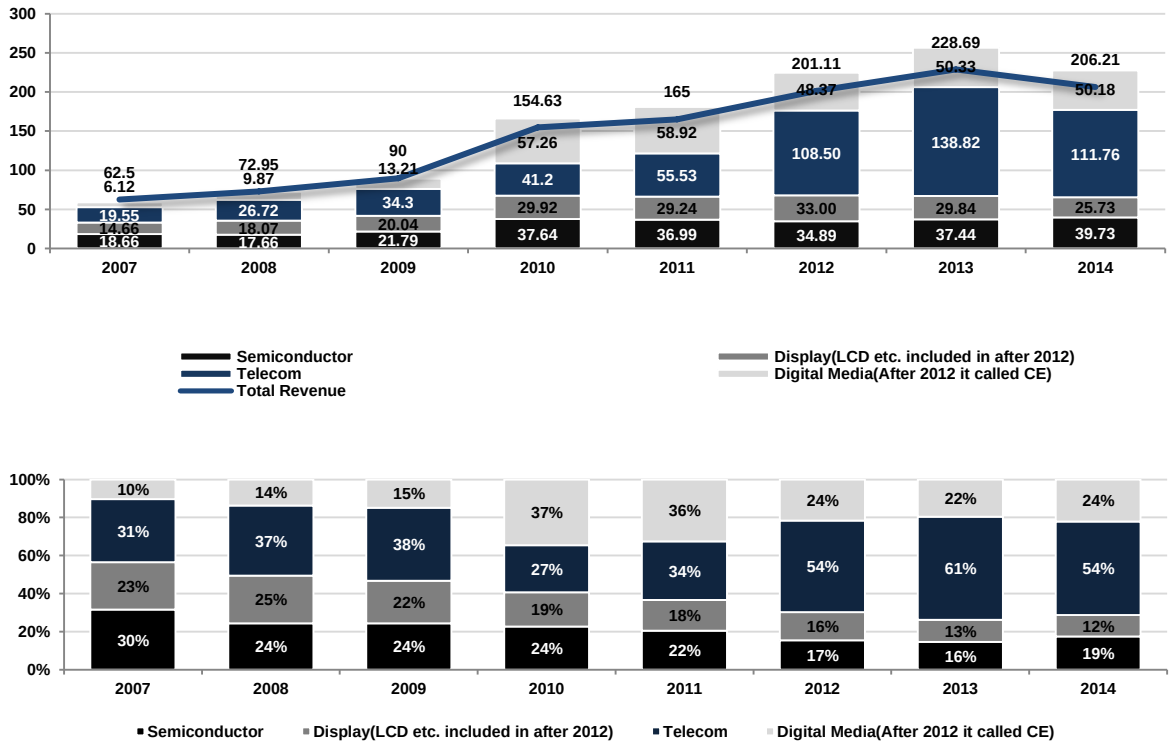


Figure 5.21 Samsung revenue growth (Trillion KRW) (above) and portion of product and services provided (below) (Samsung Earning Report, 2007 -2014)

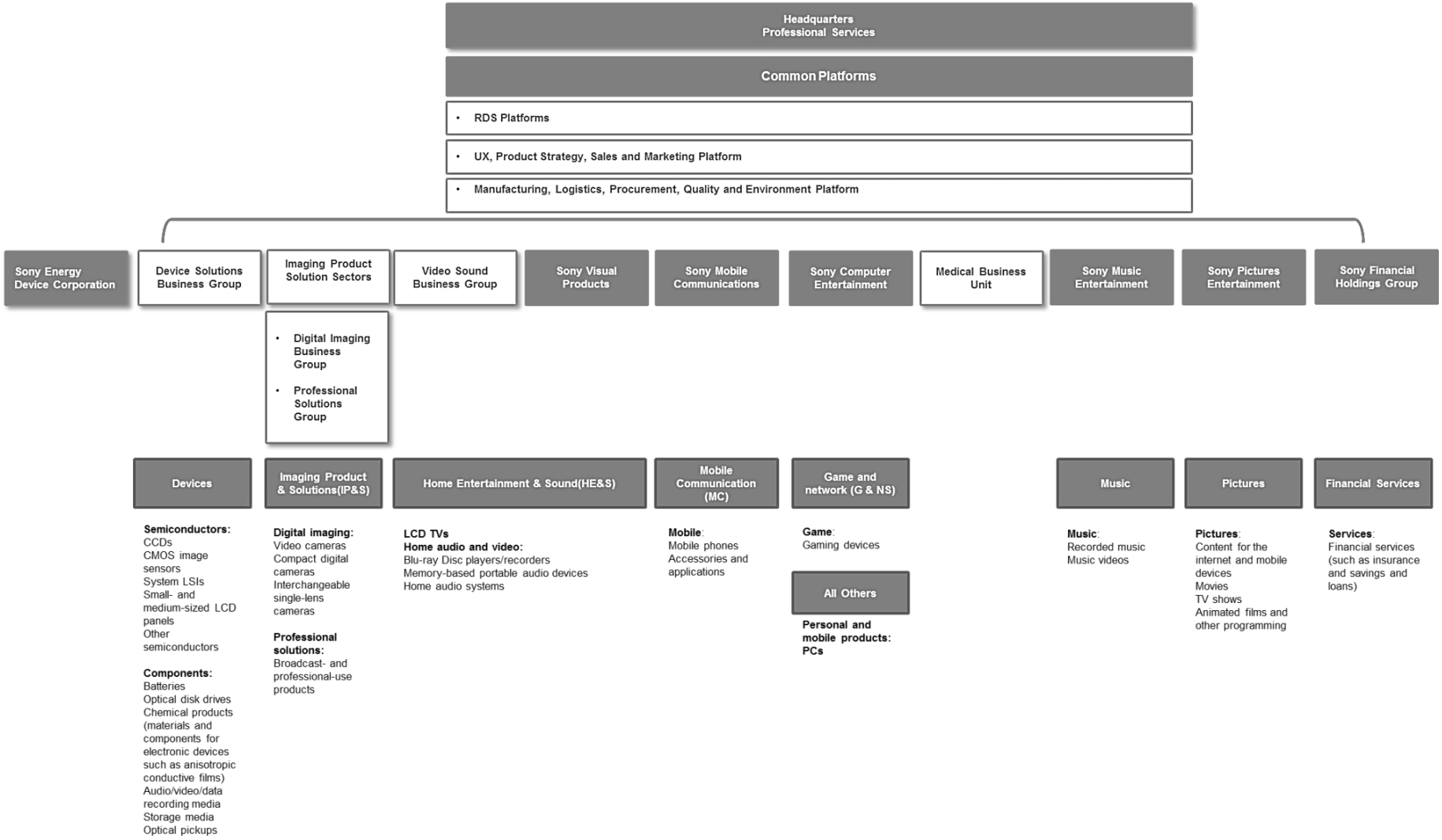
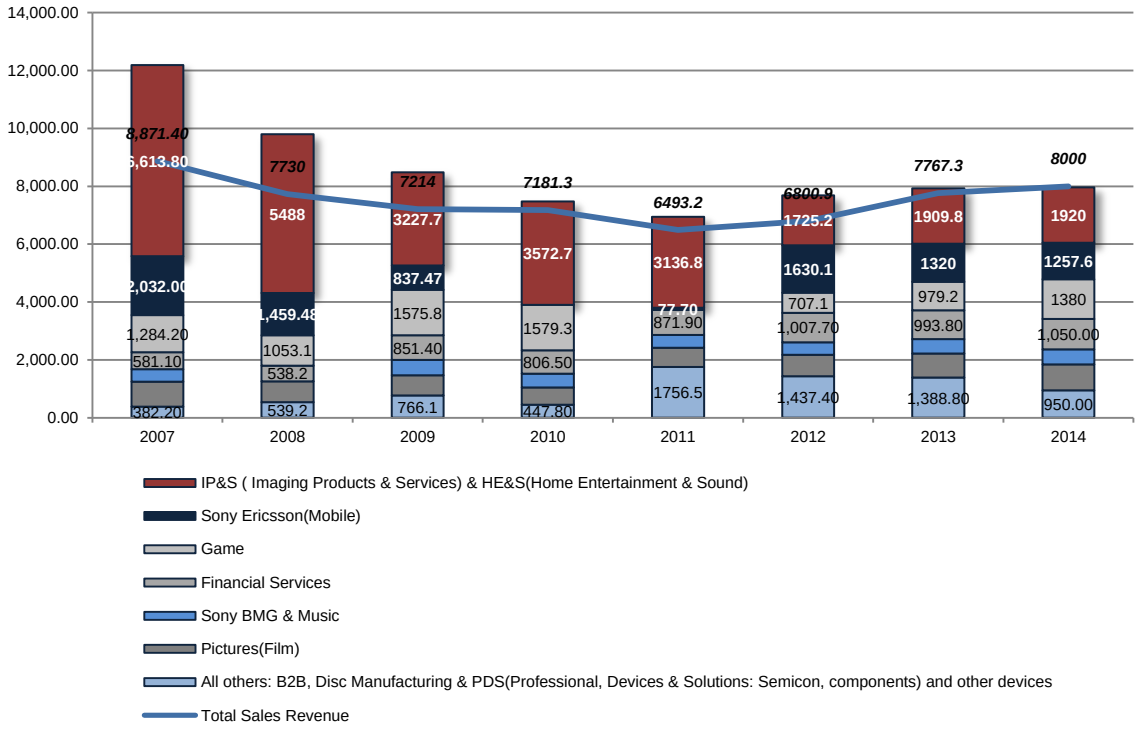


Figure 5.22 Sony organization chart and product and services by the division (sources: the company webpage, and Marketline report 2014)



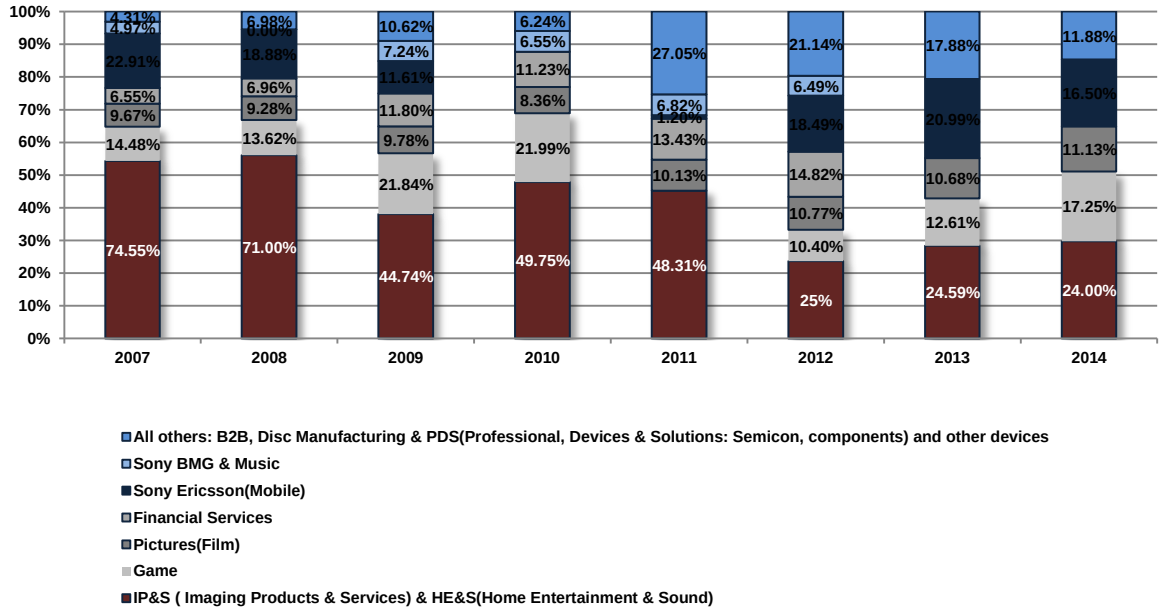


Figure 5.23 Sony revenue growth (billion yen)(above) and portion of products and services provided (below)

(Sony Earning Report, 2007 -2014)

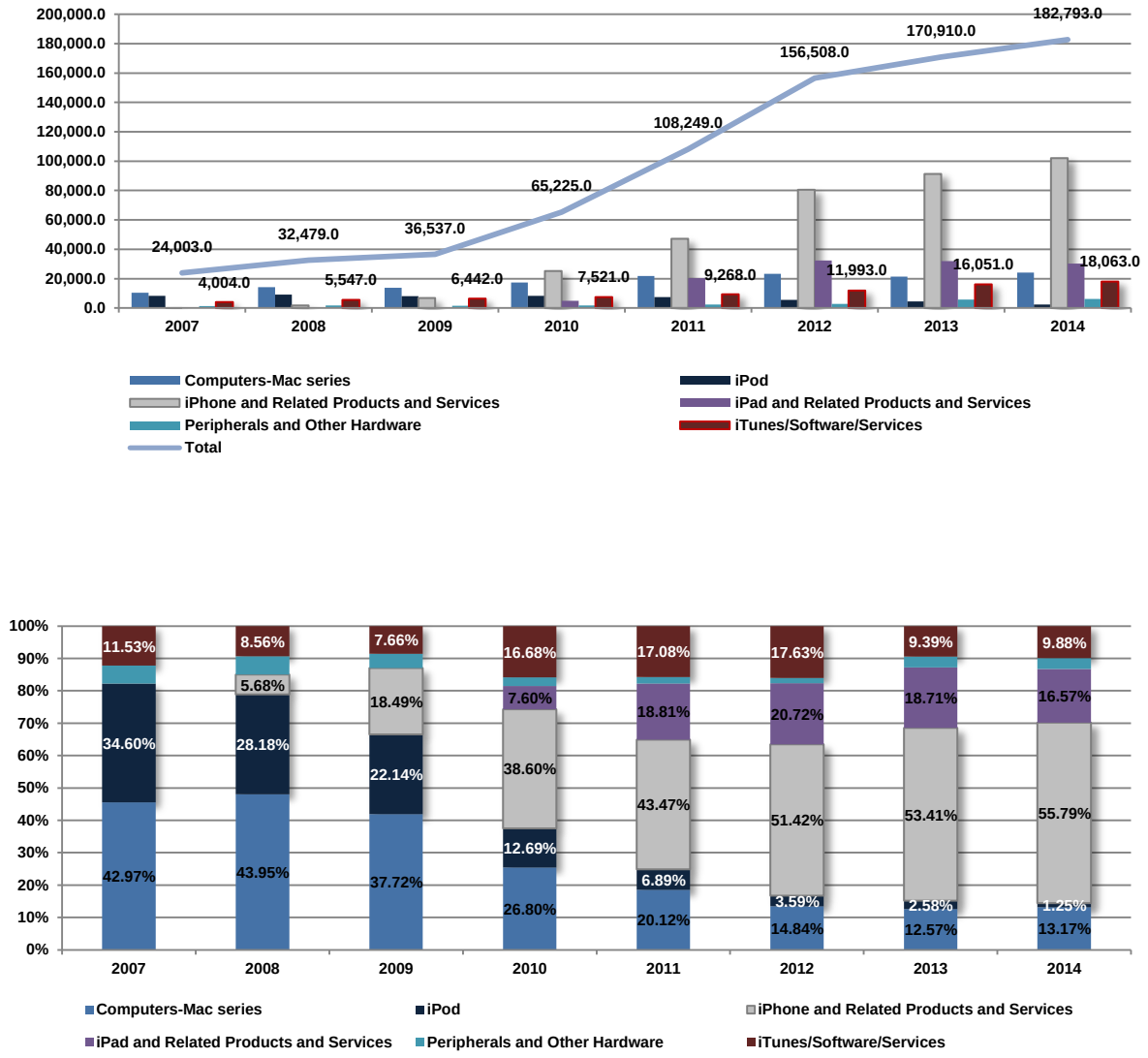


Figure 5.24 Apple revenue growth ($ Mn) (above) and % of products and services provided (below) (Apple Earning Report, 2007 -2014)

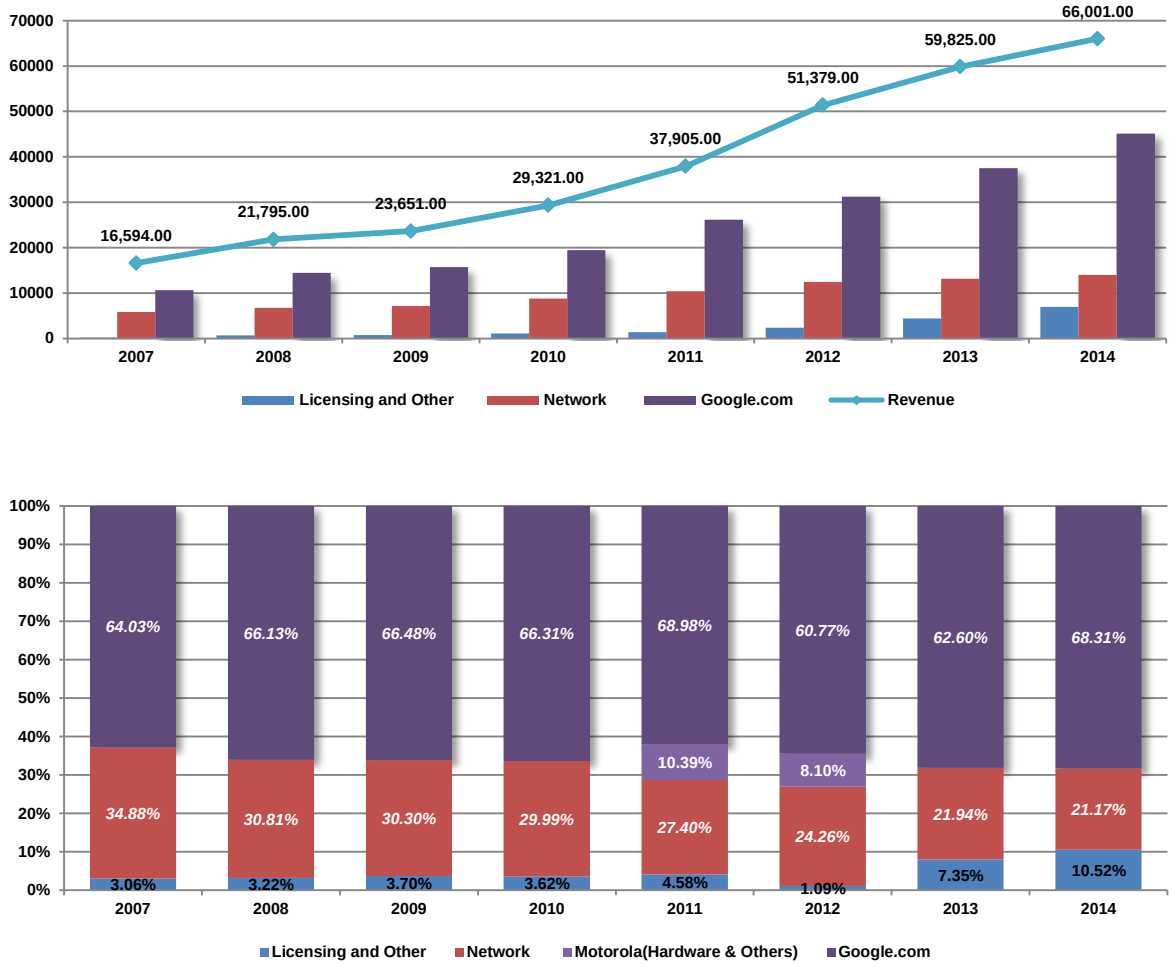


Figure 5.25 Google revenue growth ($ Mn)(above) and % of products and services provided (below)

(Google Earning Report, 2007 -2014)

5.3.3.2. Territorial issues within the organization structure

In relation to the design capability absorbed in an organization's structure, territorial issues that inhibit the digital platform strategy are found between the hardware and software design, across normative and behavioural structures. This is part of enacted organizational cultures in actual design practices (see also section 5.2.2.2). The issues are specifically described in enduring hardware domain cases as the following diagram shows.

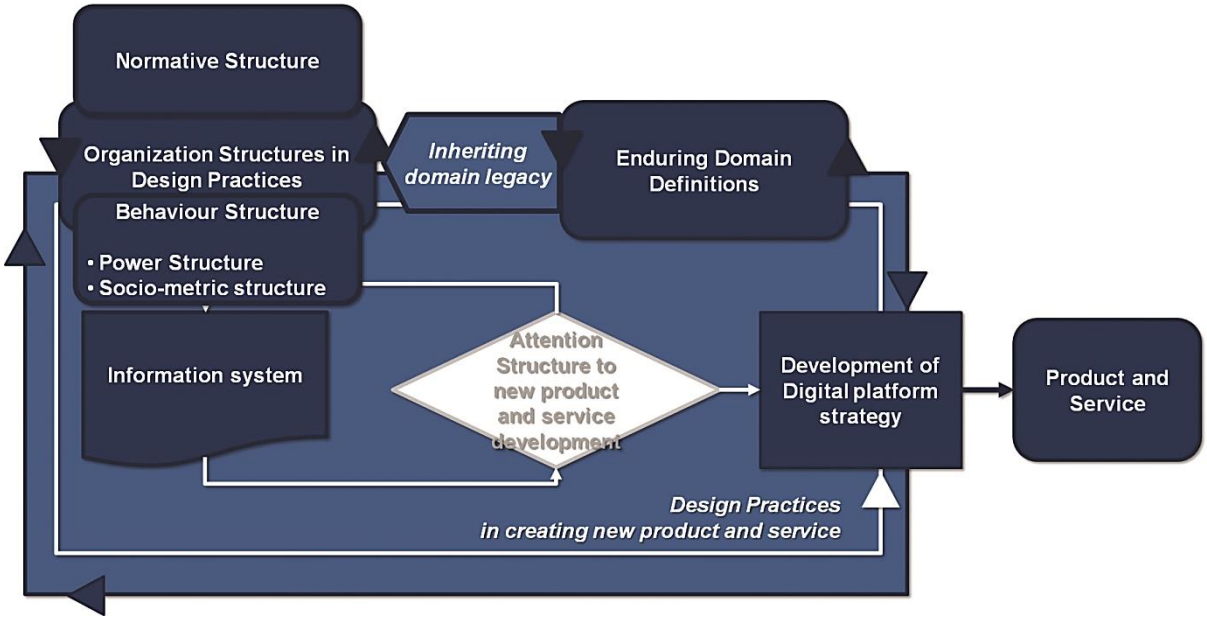


Figure 5.26 Organizational structures affected by domain definitions in enacted organizational cultures

First, the normative organization structure of an organization, which is configured along with an initial domain definition, is developed in alignment with certain power structures following its initial domain structure; that causes it to form its behavioral structure between the professional members in their design practices. In one organization, the rigidly established power structure affects the assimilation of its design capacities into the development of one digital platform that is loosely coupled for responding to constantly changing users and its complements needs (note Section 2.4.3.3; Yoo et al., 2010).

"Nokia is a large organization which has been repositioning industrial designers as the head of experience. Did Apple promote Ive? I think they need to have a more clearly defined mission. A Samsung screen here, this and that, because of all the Samsung components you can put them together, but the customer experience has its own marketing channel, design and all of that stuff. As long as R&D is the power structure that is divorced from that market, full of people who think that they are no better than their market, then, they have always been dangerously miss matched."

[EG_5; see also about an US company in JG_9 and VD_9]

Second, a rigidly fixed organization structure, along with its power structure, can cause conflicts to assimilate heterogeneous types of design elements into one digital platform. For hardware domains, the roles of engineering parts are likely to be given more importance than software design, as they have done. They intervene in all design processes, like administrators with their own logical, resource-based exploitative approaches. This even affects designers' collective sentiments; design professionals are more concerned about explicit factors and the benefits in the design processes, rather than conceptualizing their design ideas.

"We* have grown up with manufacturing up to now […] so designers just operate 3D rendering with ideation for that, and it is sent to engineers, then they make sophisticated components for hardware."

[JH_18]

"The Sony platform is not a fantastic platform. The problem is that Sony in Japan has a real hierarchy. One person in the head and everybody is imposed to it and everybody who is doing that job. For hardware oriented companies, you can get feel like you are a part of the process."

[VD_22; see also about a Korean company in JC_18]

* A South Korean electronics company

Last, these territorial issues can cause severe deviations in the actual decision-making in the development of a digital platform strategy due to lack of holistic sense. Hardware domain organizations, such as Sony and Samsung, are likely to be featured in mechanistic bureaucratic elements (see also Section 2.3.2.2), which are concerned with alleviating unprecedented conflicts emerging from multiple authorities that take part in the NPD process. This causes less agility in decision-making and also misconceptions of holistic design approaches in the development of digital platforms. This is caused by particularism within the organizations, which are vertically integrated in hierarchical and reductive methods, aligned with their hardware product architecture as the following shows.

"Well, for instance, there was this product that we wanted some years ago? It was called Xperia play*. But the device (launch) got delayed because it would be kind of zombie, die and come back and die and supply it. Because the top managers of each division will(should) reach agreement on who does what!? Like…"who does this part…of software?", "who does marketing?", "who does this?", "who does that?". So…sometimes… let me clearer…Sony's structure…it is really good to foster innovation because you have multiple teams. That has…relatively speaking…a lot of freedom…to do export things. But when it comes to shipping, there is discussion regarding "who is the owner of the product?", "who is responsible to achieve something?", "who is going to take care of launching?" and so forth and so forth…

[JG_10]

"That could be difficult. So when tablets came to life, Sony didn't list tables until much later and the reason for that was, I think, that everybody thought that another division was doing it! Sony Ericson thought "oh, no! Vios is doing it! Vios thought, "no…no…Sony Ericsson is doing it"!!! "Everybody presumes they are doing something. In terms of plans to integrate features and other networks, they are poor, very, very poor!"

[VD_9]

*** a handheld game console smartphone produced by Sony Ericsson and launched in 2011**

To sum up, development of digital platforms is closely associated with organization structure and its power structure cascaded from its initial domain definition. Especially in hardware domains, which are vertically and tightly integrated into their own product architecture, these issues are seldom divorced from political power, along with their own organization's structure, political maneuvering and information manipulation.

Organization Structure		Concerns
Normative Structure		• Normative organization structures optimised for diversified hardware product lines and at the same time vertically integrated organization structures
Behavioral Structure	Power structure	• Each power in an authority web considers the exploitation of its own explicit benefit and the power structures are multiple layers across the structures
	Socio-metric structure	• Complication of power structure, leading political maneuvering as manipulated information; lack of agility and adaptability in response to changing needs e.g.. delayed decisions on tablet PC launching in Sony and lagging behind to build holistic digital platforms

Table 5.9 Concerns in development of digital platform strategy in hardware domains

5.3.3.3. Attention structure in action in approaches to managing design: exploitation and featuritis[18]

Attributes of the traditional new product development process still significantly affect organizations' attention structures, although all kinds of governing elements are seemingly diluted in digital innovation (note Sections 2.3.2.3 and 5.2.2.3). Different levels of concerns about exploitative elements, allocation of resources and the following financial outcomes, are situated in the formation of different features of organizational cultures in organizational approaches to the digital platform strategy (Figure 5.27).

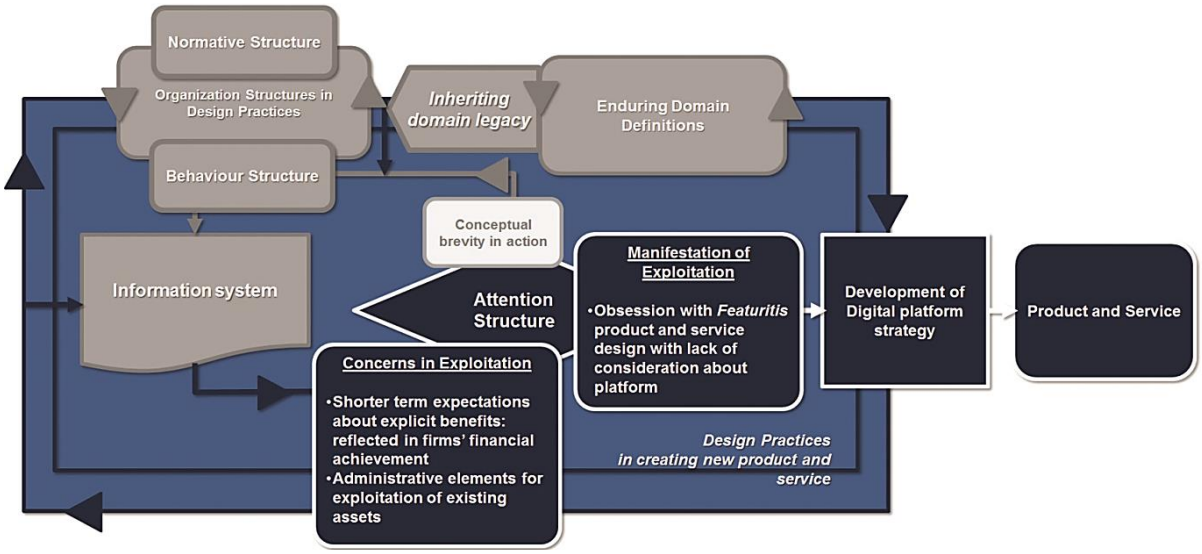


Figure 5.27 The exploitative elements that affect attention structure in digital platform strategy development

First, developing a digital platform strategy for holistic design is hindered by an organization's shorter-term expectations over its explicit financial outcomes, within a limited timeframe to launch the new product and service (see also Sections 2.4.4. and 5.2.2.3). However, initial domain definition of an organization significantly affects the explicit considerations in hardware domains, since the

[18] Donald A. Norman (2013; p.261) raised this issue in his book, 'The Design of Everyday Things'. As a product follows all the design principles and the product is successfully sold to customers, it makes the company push towards the additional new features in order to compete in the market and increase the demand.

development of hardware devices is, more concerned with viable manufacturing in product lines, there are more complicated organizational censorships over financial outcomes, by reducing spending.

"This gives a cost, two to three weeks to add to the project and this was a very tough discussion for me to validate. While Steve Jobs or whoever, Spotify can earn 2 billion a month! But you can only have a maximum 20 million, because they can only produce 20 million units! Right, the elements of that, that's why hardware has a bit of difficulty. They have no idea of how to execute software and how to have a strategy to enable it. Because they (Sony) are still in an archaic hardware world!"

[VD_11; also TK_6; and see also about software application design in JT_7]

Looking at Figures 5.27 and 5.28, both Samsung's and Sony's operating profit margins by providing products and services show their significant concerns about 'making goods', rather than creating generative meaning with products. The focus of manufacturing hardware devices is figured in lower operating profit margins.

In the case of Samsung, the range of percentage of operating profit margin for mobile products and telecom parts is not over 20% (10% - 18%), compared to the component parts, semiconductors, shown to rise from 11% to nearly 30% in the period from 2007 to 2014. In other sets of digital product lines, such as smart televisions and home appliances (featured in digital media), the percentage of the operating profit margin is even much lower than smart devices, which rose from -6% to a maximum 5% in the same period (Figure 5.29).

On the other hand, Sony's results are much more critical as a hardware manufacturer. The figures on the average operating profit margin between 2007 and 2014 in mobile parts (Sony Ericson and after 2011, later acquired into the Sony Mobile Communication part; Sony earning report, 2011) were shown to be around 2%, although the product lines proportion of the company's sales revenue were nearly 20% between 2007 and 2014 (compare between Figures 521 and 5.29).

It indicates that, for hardware manufacturers, it is important to consider their financial rewards, as the financial impacts of revision and assembling on existing product concepts are much less, unless generating software services or competitive products are driving the market and new technology due to the value chain of the electronics industry (see Figure 2.4; Shin et al., 2012).

Second, in order to control these organizations (i.e., hardware manufacturers) they have concentrated on their administrative elements, assigning multiple gatekeepers with the authority to control these resources as the following shows:

"Whereas, when I was in Sony, we were very eager to launch a metal phone or aluminum devices, which were steel based and it took two and half years after all the companies started to launch metal based ones. The main reasons was not that the company was not capable or that it wasn't smart, the main reason was that the company owned most of the production facilities and, at that time, all of that equipment was for plastic injection molding. So in the case of Sony, obviously, you need to make investment to retool eventually, and to start off the product."

[JG_10; also VD_9]

It implies that as digital technology and its design practices becomes more complicated and requires openness for generative design practices; ironically, hardware manufacturers' organizational attitudes can become much more centralized, due to the unprecedented risks to be managed in the design process, much more tightly coupled analytic and explanatory reasoning is prioritized for its allocation resources and this causes an obsession with shorter term expectations of its financial outcomes.

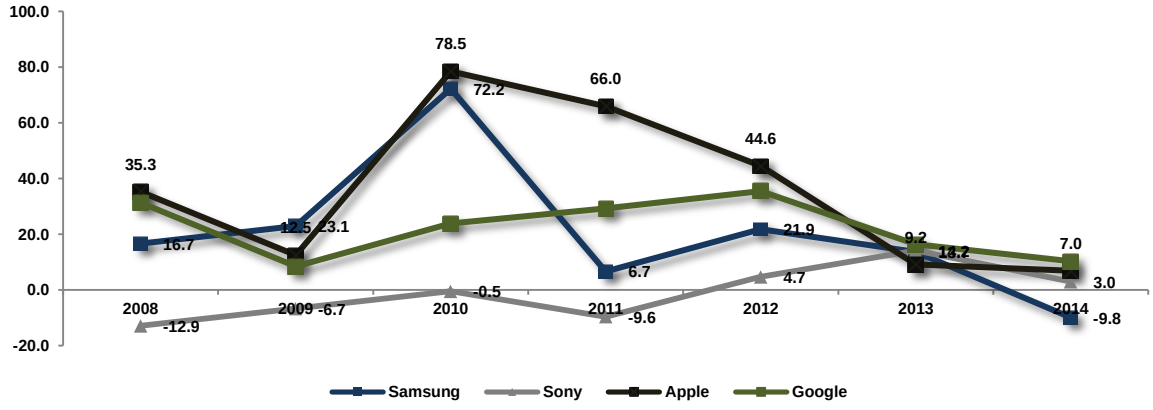


Figure 5.28 The growth rate of sales revenues in selected cases (the companies' earnings reports from 2007 - 2014)

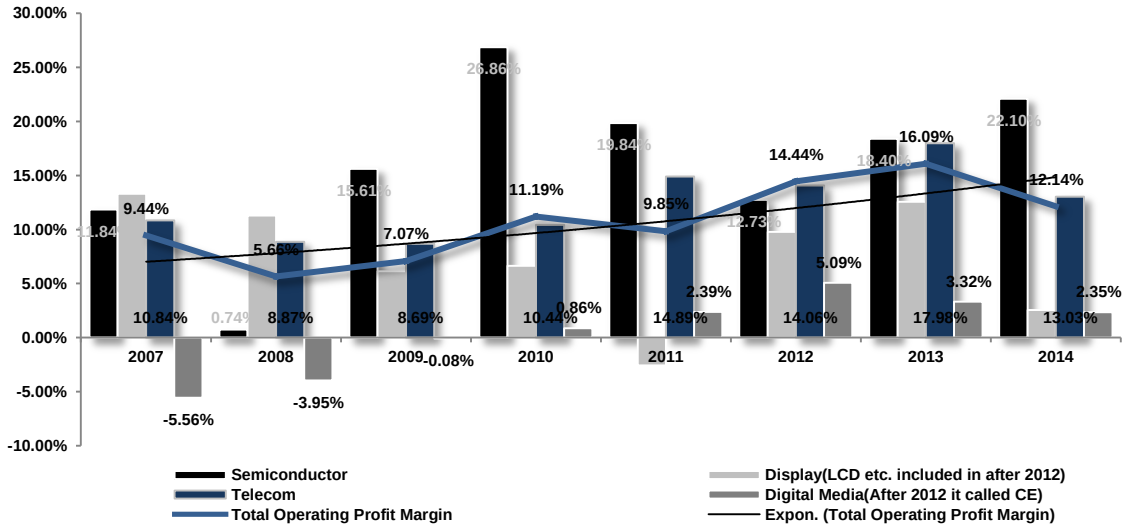


Figure 5.29 Percentage of total operating margin and the profit margin by the provision of products and services in Samsung (the company's earnings report, 2007-2014)

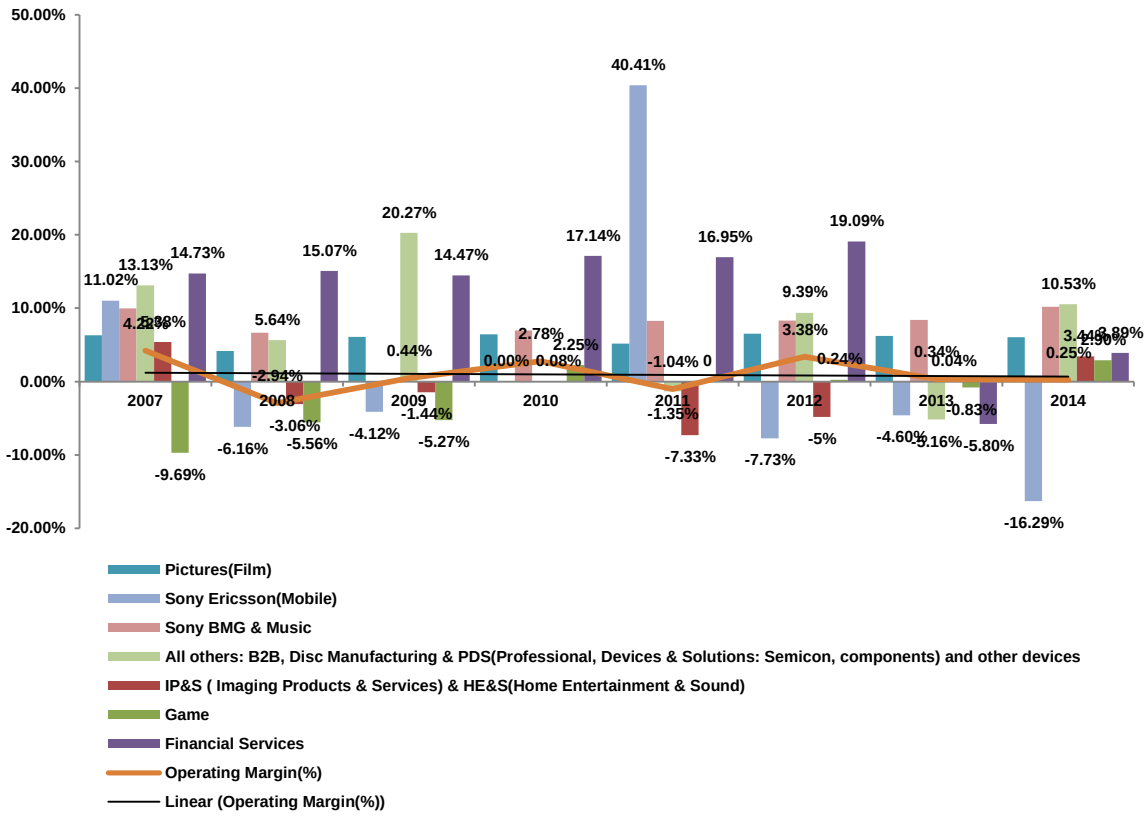


Figure 5.30 Percentage of total operating margin and the profit margin by the provision of products and services in Sony (the company's earnings report, 2007-2014)

Second, the shorter-term expectations of financial outcomes cause an organization to fall into the trap of *featuritis* (see Section 5.3.3.3), especially for hardware domains. In fact, after 2007, Samsung achieved its success by diversifying its wide range of physical product lines based on the Google Android platform (Vogelstein, 2013), with its strategy of following the example of leading competitors, such as Apple. However, this is a misconception of digital materiality, which hardware domains make. It causes significant failure in the markets, such as HTC (Taiwan) because the strategy focusing on *featuritis* requires incremental capabilities supporting the diversification strategy to reduce its spending in its value chain as follows: (see also Figure 2.4; Shin et al., 2012).

"HTC is an interesting one, right? Because they were the darling, they were the design-led, they invested heavily; what have they done wrong? It's just been only as good as Samsung. So, I don't have absolutely started up here because we can look at the massive growth of the android handset across the world! What happened to this? Samsung just takes a great share about it as the expansion of HTC? Now you could say that HTC is increasingly looking like a case study of failure and maybe, only the reason that they didn't do it was trying to expand diversified. You know, let's say, the big, big Galaxy 5 is big art. Samsung really put money into that."

[GF_17; see also JC 14]

Featuritis product design is accomplished by *adding* new features onto existing product lines, such as enhancing camera resolutions and revising the functions and managing launch time for short-term

success, in accordance with traditional NPD principles (Section 2.4.4.3; see also Section 5.3.3.3). But holistic design approaches consider products and services as whole and human interactions with the artefacts still missing.

"Something that you can look at to understand the differences between a software versus a hardware company is the cameras on the devices. At the end of the day, everybody wants Android, it is used in the same platform. So they can customize the software a little bit. They cannot by application, they cannot change those allocated applications but their areas were bringing them value; their areas that they have really put in hardware. Everybody's factory is able to find what camera censor is what chipset, what will be a solution and they can work on having the best integration possible on the software side, like making the camera wake up as quickly as possible, taking one note. For us in Google, if you go and buy a Google Nexus device or Nexus 5 or something, our camera, the experience of software is nice and it is very simple. But the overall performance is not the best. It is still good, but it is not the best."

[JG_6; see also JC 14]

This can be demonstrated in the relationship between their revenue and operating profits. In the case of Samsung, new features and high-end digital products, such as smart mobile devices, are likely to make incremental gross financial benefits (gross revenue) and this is recorded in massive operating profits with cash (Figures 5.21 and 5.31); but its operating margin rate (%) in those product lines is even lower compared to other product lines, such as components (Figure 5.29). Considering the four cases, Samsung and Apple mobile devices achieved massive operating profits between 2007 and 2014, and this trend is reflected in the growth rate of sales revenue between 2009 and 2010 (note Figure 5.28). However, it indicates that Samsung had copied the methods of Apple, in terms of its product strategy, with little consideration of its digital platform, so it could achieve massive revenues within that period with rapid product line diversification and sleek hardware design; yet, its operating profit margin rate is still lower, due to a lack of holistic design strategy and heavy reliance on a hardware-focused design strategy (The Economist, 2010; Yoo & Kim, 2015).

Last, more than all these issues, concerns about the allocation resources and design of *featuritis* products are demonstrated in their R&D intensity. This can be an indicator as to whether or not an organization is interested in generating really 'new' product and service design from holistic or longer-term oriented perspectives.

"For instance, there was this example. When we see the iPhone and when laying the phone a volume button will appear on the screen and this can be the shutter button too. But this function was not featured in the iPhone 1 or 2 series. So, at that time, Samsung engineers suggested this and it was an attempt to add this function to their Samsung Haptic Phone. So, a deputy manager who had the idea asked a Samsung director if the function would be added. The Samsung director responded to him, "What a meaningless idea that is! Why don't you do more valuable research?" So they had to turn down the project at that time."

[JC_19]

In fact, hardware manufacturers such as Samsung can successfully achieve maximized tangible operating profits with diversification of high-featured products and sleek physical designs. Yet, this

comes more from shorter term-oriented perspectives for existing material, rather than consideration of holistic design approaches, that underline the universal logic regarding how a product or service is integrated with other digital materials and users.

In fact, in comparison with Samsung (and also Sony), Apple and Google's overall operating profit margins are made from neither a finely engineered product nor high-featured camera functions. Rather, it comes from their software platforms (e.g., iTunes and Google Android), which have gripped all users who use them, rather than being focused on manufacturing high-featured physical devices (see Pisano, 2015 The Economist, 2010).

For Apple, the Mac service platform and the operating system representing iTunes and iOS have shown a stable increase since 2007 in its financial outputs from $4,004 million to $18,063 million (growth rate: 94% from 2007 to 2014) (Figure 5.33). Likewise, Google's achievements in operating profit is also based on the Google Android platform and relevant system that can control hardware manufacturers that use the service platforms (Figure 5.34).

"A good example would be, even within software developers, they have different kinds of software development. Android, that platform it is on, it is more perfectible side of things, because it is not just an operating system. Their norms are very well established, right?"

[JG_9]

Furthermore, the different approaches and incubation process of those holistically accomplished digital platforms are proven in figures on R&D intensity and R&D investment per sales revenue (Figure 5.35). Even compared to other hardware manufacturers such as Sony, Samsung' s rate (%) of R&D intensity is not overwhelmingly exceeded by Sony, despite Samsung's incremental achievement on sales revenues. The range of R&D intensity is at an almost similar level with Sony, in a range between 5% and 6%, since 2007.

On the contrary, Apple and Google have shown clearly different patterns concerning holistic approaches to their products and service; Google has invested massively in R&D spending, rising from 12% to 15% in R&D intensity for that same period; Apple's R&D intensity is much lower than any other hardware makers' average R&D intensity, such as Samsung, Sony, HTC and ZTE (see also A.3.3.from page 422). This shows that Google thinks more about pioneering projects, which have never been attempted before by other competitors, such as the moon-shot project, rather than an exploitation of their capacities (The Economist, 2015). On the other hand, Apple could have achieved its impressive profits beyond the average rate of R&D intensity and this is based on its own established digital ecosystem (iTunes and iOS) that users are encouraged to use on their hardware products, iPhone, iPad, etc. ; it does not involve big technical changes (Pisano, 2015). Both firms' achievements are, however, based on their holistic approaches to their product and service design with their own platform.

It can be concluded that, in consideration of initiatives for design inquiries, Samsung and Sony's platform strategies come from a 'tipping' product strategy; whereas, Apple and Google's are characterized by a 'coring platform strategy', which can enable, not only platform complements, but also users to be involved in their generative design practices (summarized in Table 5.10).

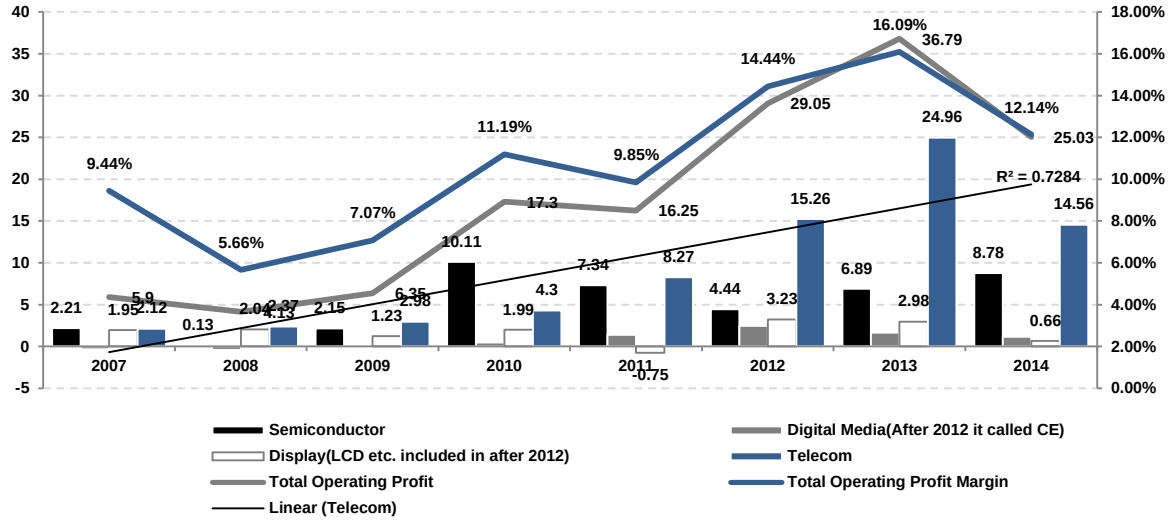


Figure 5.31 Operating profit and the operating profit by the product and services in Samsung (Trillion KRW) (the company's earnings report from 2007 to 2014)

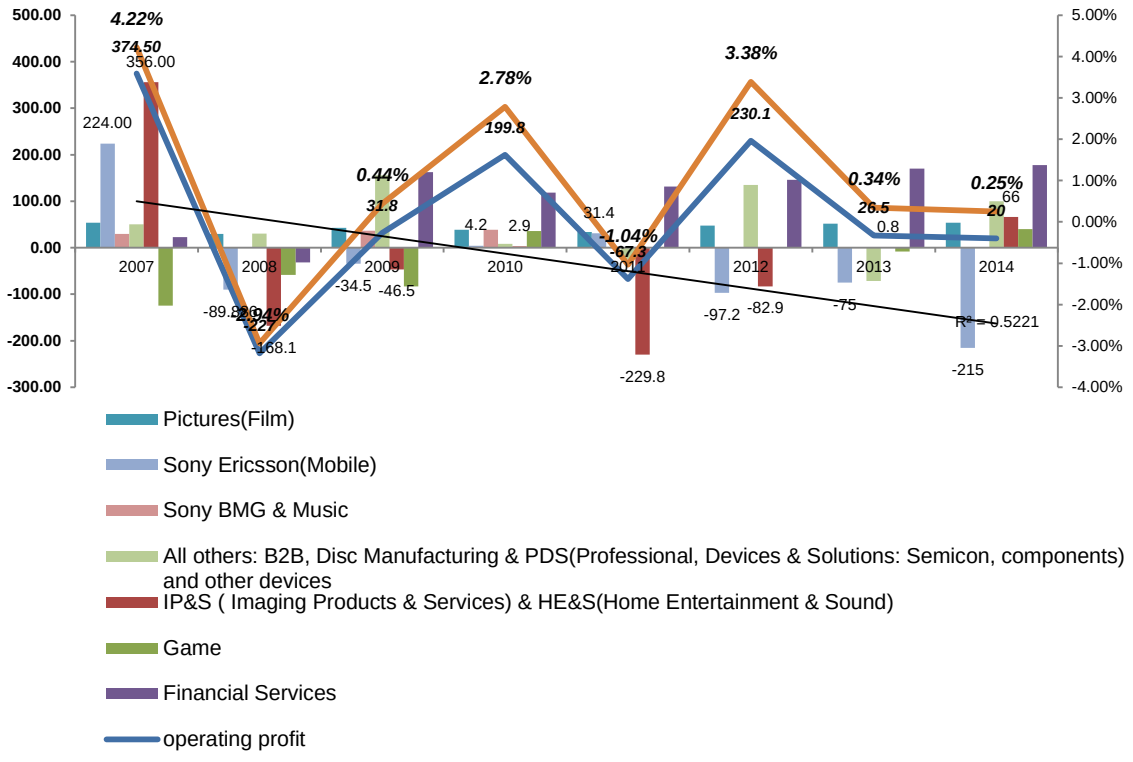


Figure 5.32 Operating profit and the operating profit by the product and services in Sony (bln yen) (the company's earnings report from 2007 to 2014)

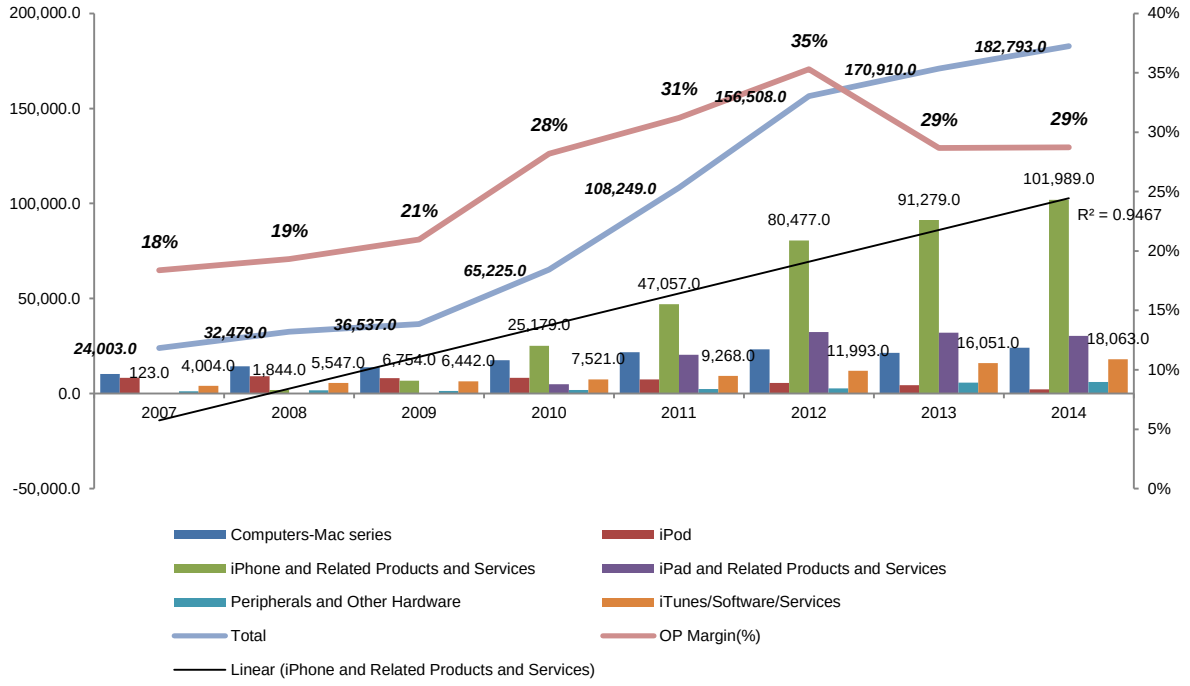


Figure 5.33 Operating profit and the operating profit by the product and services in Apple ($ Mn) (the company's earnings report from 2007 to 2014)

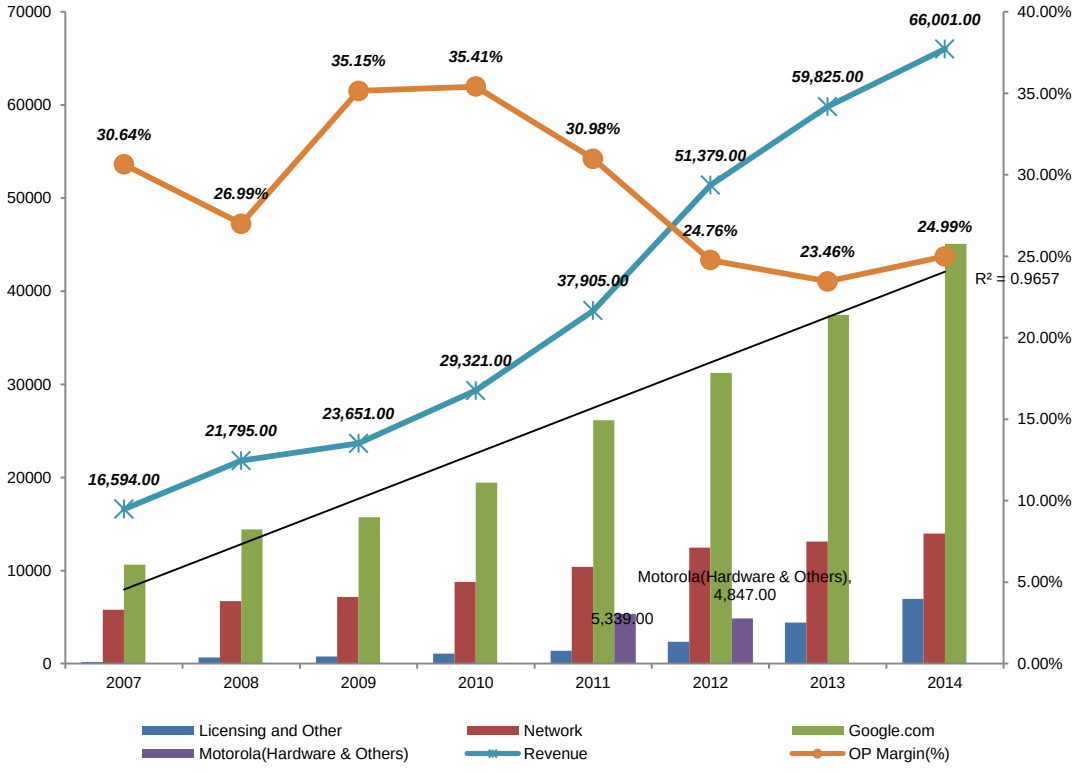


Figure 5.34 Operating profit and the operating profit by the product and services in Google ($ Mn) (the company's earnings report from 2007 to 2014)

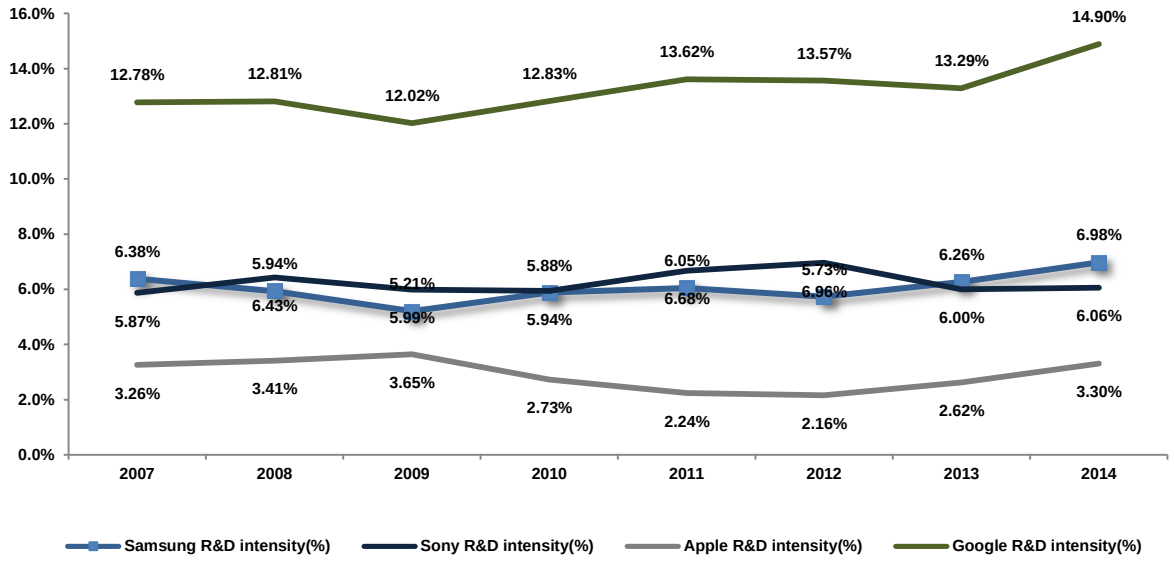


Figure 5.35 R&D intensities of four companies (% as revenue per R&D investment) (the companies' earnings and annual reports from 2007 to 2014)

	Samsung	Sony	Apple	Google
	Tipping platform strategies		Coring platform strategy	
Features found in attention structure	**Agile decision making to exploit existing hardware manufacturing capacity** • Higher overall operating profit in hardware final goods areas (telecommunication and consumer electronics gadgets, etc.,), compared to component parts (semiconductors) in the period between 2012 and 2014: Final goods: 15-25 Trillion KRW Components: 4-8 Trillion KRW • Yet, recorded relatively lower margin rate (%) in the final goods parts (between 5 and 15% level) compared to the component parts (12-23%).	**Lack of agility in decision making, despite a wide range of product and component lines** • Poor operating profit and the margin rate across all hardware product lines (e.g., mobile sections,2% level in % of operating profit margin)	**Operated based on established Mac platform (hardware and software)** • Stable growth of overall operating profit and the overwhelmingly compelling operating margin rate (overall 30%) based on the Mac Platform (iTunes and software system), compared with other technology companies • Producing limited range of hardware product lines, based on the given platform,	**Operated based on established digital platform (Google.com and network system)** • Radical growth of overall operating profit and the overwhelmingly compelling operating margin rate (overall 30%), compared with other technology companies • Little interest in hardware manufacturing (e.g., Motorola' operating profits between 2011 and 2012).
R&D strategy in design management implies…	**Risk taking strategy to exploit existing product lines** • Average level of the R&D intensity (6%) revealed sales focused tipping strategy	**Risk averse to sustain its business** • Average level of the R&D intensity (6%) concerned with covering spending costs	**Opportunity exploration with exploitation of existing assets** • Much lower R&D intensity than the average level due to higher market performance	**Opportunity seeking to explore new opportunities** • Much higher R&D intensity than the average level: much focus on 'novelty' or 'newness' beyond market performance
Approaches to design management	***Featuritis(see Norman,2013) and Assembly focused on 'Product Strategy' for exploitation of existing product assets***		***Focused on establishing 'platform' and exploration with sub-products based on the established platform***	

Table 5.10 The features of digital platform strategies and design management

5.3.3.4. Conceptual brevities and limitations of generative design practices

In relation to parts of attention structures in enacted organizational cultures, it was demonstrated that the different strategic approaches to design practices in the East and West can be affected by such

tacit features of organizational cultures, as looking at attitudes in conceptual brevity. However, this causes significant results in the competitive landscape of digital innovation. The main concept of designing is aimed to cloud multiple heterogeneous sources and collect open sources from diverse design participants in less-hierarchical situations for generativity (Krippendorff, 2011; Sanders & Stappers, 2008), it is not ideally adapted in actual design practices (note Section 2.4.3.3 with Section 5.2.2.3.3). This is well depicted in another story about Rubin's (the founder of Android) meeting with Samsung board members in South Korea to presenting the Android service, as the following shows:

"And, at the end and I am out of breath, with the whole thing laid out there is silence. Literally silence, like there are crickets in the room. Then I hear whispering in a nonnative language (Korean), and one of the lieutenants, having whispered with the CEO, says. "Are you dreaming?" The whole vision that I presented, their response was "You and what army are going to go and create this? You have six people (the cofounders of Android). Are you high?" is basically what they said. They laughed me out of the boardroom. This happened two weeks before Google acquired us..."

(Vogelstein, 2013: p 54)

Likewise, in primary data sources, such idealistic generative design practices are fundamentally inhibited in the conceptual brevity dimension.

Organizational cultures in effect in generative design practices

"Eastern clients will never openly 'brainstorm' in the presence of their superiors, in case they are 'wrong'. Separating them into different rooms to allow them to be creative can mitigate this. Eastern clients will also agree on too many things even if they do not mean to do so - this is not very productive and very confusing for us as designers."

[RB_4]

First, generative design practices are reacted to by differently design participants in design practices in the Eastern- and Western-based organizations and this can affect approaches to holistic design management (note also Table 5.2 in Section 5.1.5; Section 5.2.2.3), due to enduring attitudes in conceptual brevities situated in certain hierarchical manners. Unlike idealistic design theorists' arguments (e.g., Sanders & Stappers, 2008) these concepts are fundamentally restrained by enduring organizational attitudes, the Eastern-based organizations prefer formal, hierarchical and clear manners between recipients and a speaker in a structural manner; so these generative design activities (creative workshops and collaboration activities, brainstorming, etc.,) are rarely accepted by designers because of their tightly-coupled organization structures in behavioural levels between the members. For them, the generative design practices are unstructured, obscure, unreasonable and peripheral activities; and these activities are perceived as formal activities performed for their own sake.

"I have even done it (a creative workshop) before. When I organize and host a workshop, even the meaning of a workshop to them (Korean) is totally different to them, what they have to do in a workshop, what is meant for a workshop? […] In the case of those big meeting times, mostly a director tends to dominate it in talking and then the general managers give a few comments on it and then it finishes! It seems like a school lecture! Sometimes, senior designers speak out but it is not a discussion at all."

[JH_19; see also DT_14; JT_8]

Second, ideal theorists studying open design have shown little consideration for actual corporate cultures affecting subsequent adaptive systems: leadership, administrative structure, etc., (e.g., Sanders & Stappers, 2008; Rasch et al., 2009). Any organization is shaped through a certain degree of hierarchy for their best results and hierarchical manners of an organization structure are inevitable.

"For instance, if senior managers and deputy managers are involved in a co-creation action, this could work without any disruption. But, without a consensus by superiors, there are some tendencies that they will try to disrupt our ideation and generate concepts by picking up what we do. This is because their general manager cannot understand what the idea was, if the general manager was not in present at that time. Yet, if all those members agreed by seeing the process, those risky troubles can be reduced, as there is a back-up reason. However, it is clear that there are more of those tendencies, making the decision making process in the Eastern based clients as well as Korean ones much more complicated."

[JT_9]

Within an organization it is a kind of culture things. He is more senior than me (I need to do) utmost to respect his opinion…if he can see something like this he must have some reason for him to say this. So I can only advice to him because of my knowledge. So…but he is one guy who makes a big decision…I don't think it is going to affect creativity. Because of hierarchy.

[WH_10]

Although idealistic generative design practices, open design, Co-design etc., are seemingly less formal and less hierarchical domains, they are constrained by corporate mechanisms forming an organizational culture.

Concerns about realities in complexity

Following this, this study found fundamental skepticism towards the generative design practices. Theorists in open design areas have paid less attention to a reality situated in the competitive edge of complexity of technological and marketing issues (e.g., Sanders & Stappers, 2008; Rassch et al., 2009): inevitable exploitative elements in actual organizational design practices and challenges of integration and adaption of heterogeneous design elements.

First, any kind of design practices at the organizational level are rarely divorced from issues of explicit concerns about perceptual controlling factors, which are expected in exploitative outputs.

"I think most of the projects go to commerce to achieve certain ends, because you want a project to achieve certain business goal and resolve certain problems. When we think about open design, it is probably more about research. It's not practice. It is not making something. If you want to make something, you need to think about cost and how to make it and you need to think about how many people and what types of people participate, which is very complicated. For example, Google is a really open company. They have so many small project groups to explore every aspect of everyday life. About two or three years they closed lots of things to find out something, which was not productive so they focused their resources on more potential. In the beginning they probably can be open. After a certain stage, you should be selective and then put your energy into more important things."

[WH_11; also MR_16]

Next, it is not easy to collect informed properties from generative design activities in interdisciplinary design practices between heterogeneous professions. Although new digital technology-embedded product or service design is required to embrace heterogeneous elements in its digital materiality (service, contents, network, physical devices, etc.; see also Section 5.2.2), the level and extent of knowledge that the professionals have is not easily ignored in integrating all these complexities of products and services (see Harvard Business Review, 2015: p.27).

"I think if you look into start-ups at the moment, as you mentioned, things (IoT) or wearable products are super-hot areas now. […] It's quite difficult and it's free sources for innovation in that area. Even if it was Nokia, they would make a small watch type thing, basically, any application you have in Windows, and you can ping to it like Google, almost always now. The prototype we've written is this pipe and code. We had a Bluetooth engineering team to integrate it into a Windows phone. Fundamentally, what we want to do this is, I knew that the tiny screen is a higher resolution to get, you know. We can get it, you know, by going to Samsung or other areas. We knew we were looking for this. But it is such a long process. For me, to get for a few months for samples, if I am lucky, it would be minimum 3 to 4 months, you have got sign in at NDA, you've got a meeting, you are going to state your purpose, etc., etc.,[…] Hardware has a lot of processes and dependencies."

[VD_12; see also JC_20]

As a result, generative design practices for achieving holistic product and service design are challenged by enduring organizational contexts and this is clearly demonstrated in the differences of organizational attitudes, reflected in conceptual brevities in the East and West and also hindered in the reality of complexities in building digital materiality, including organizational capabilities involved in a design project and external institutional rules (e.g., NDA[19]) that engage in those complex design processes (summarized in Figure 5.36).

[19] **Non-Disclosure Agreements (NDA):** When either party to an agreement, discussion or negotiation wishes for all, or part of their dealings, to remain confidential, they will require the other to sign a non-disclosure agreement. This is a one-sided, or mutually binding, agreement in which the parties agree to protect the confidentiality of any discussions that take place or information that changes hands. Entrepreneurs wishing to discuss a new business idea with a view to raising finance frequently request NDAs. Very few venture capitalists, however, will agree to sign. NDAs are, also, often required by manufacturers from programmers, journalists and others in exchange for detailed information or copies of new products in advance of their public launch. For example, a manufacturer might sign an NDA to get a copy of a new operating system, in order to have compatible hardware ready for the program's launch. NDAs are often required in order to participate in beta (pre-launch) tests of important pieces of software (CapstonePress, 2003).

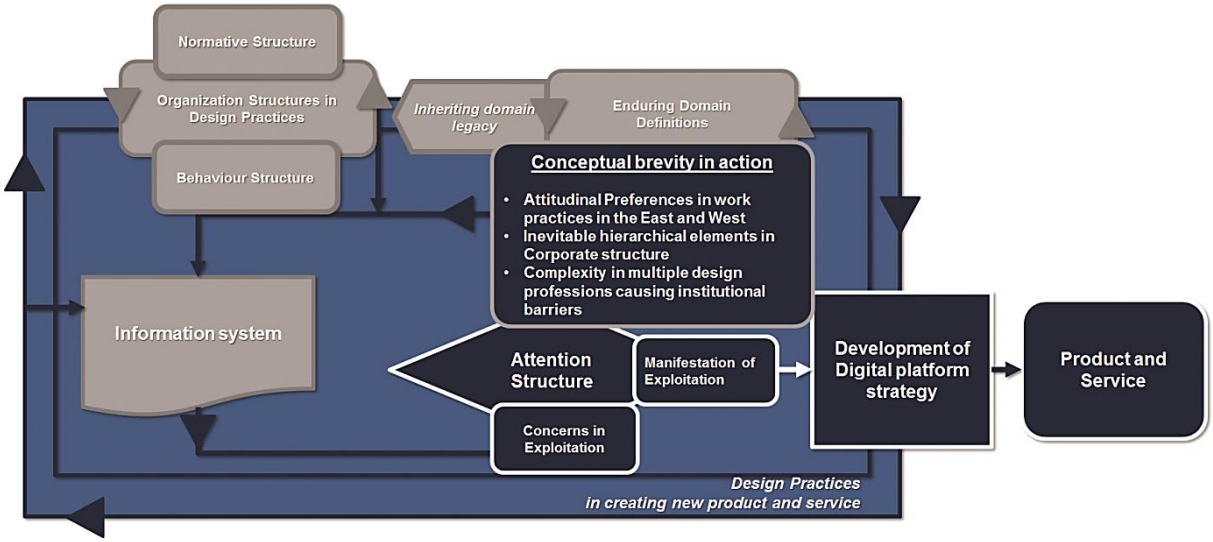


Figure 5.36 Factors that inhibit generative design practices in conceptual brevity for digital platform strategy

5.3.4. Elements of Organizational Cultures as a Root Metaphor

This study found the significance of the organizational cultures as a root metaphor for future design practices from interpretative perspectives (note Section 2.2.3 with Section 5.2.1).

The central concerns of such design practices, *designing*, are that organizational design practices are often addressed within a boundary of purposeful material and instrumental activities, even in the realm of digitalization underlining sociotechnical impacts.

First, the concept of designing, as a form of generative design practice, comes from such considerations moving beyond instrumental/territorial boundaries between professional disciplines or material structures of organizations. The emphasis of the concept is focused on tacitly shared metaphoric actions for the development of holistic design as the following shows:

"What it means is there has really been a time for cultural brand loyalties to evolve. I am using the same kind of soup as my grand mom did. OK? How weird is that? I can't be bothered to choose soup. My mother still uses the same soup. You know. You get those kinds of deep blurred cultural aspects and traditions. Cultural German car engineers are really embedded, you know, things like that. Also, there is the market! What you also have to see is 'technical credit culture', in Japan, Korea and China, to certain extent as well. Well you have incredibly intelligent rational thinking engineers."

[EG_3; also MR_24]

This is tacitly accumulated as its absorptive capacity (see also Cohen & Levinthal, 1990) in a process of coordinating and charting the relevant design actions in cognitive organizational practices. By doing so, 'designing', in this way, becomes as a rule-like method in the development of holistic products and services in organizations, as stated below:

"The European company I worked for previously had a reputation for innovation, which demonstrated vision for the future. Ideas and designs were generated without worrying whether the result would generate financial gain for the company. However, in my current company*, profit is the main driver, which sometimes can restrict wild ideas that could lead to something bigger in the future."

[DN_4; see also EG_5; RB_5]

*a South Korean electronics company

Next, it is necessary to consider holistic approaches to managing 'designing', as this is less associated with exploitation of an organization; consideration of longer-term or shorter-term oriented planning is already concerned with such exploitation. Such intended planning still implies exploitation of purposeful material actions. On the contrary, holistic approaches to 'designing' are associated with symbolic and subjective actions as intra-linked with genuine human enactment, moving beyond debates on open and closed systems (see Section 2.2.3; and Pondy & Mitroff, 1979; Smirchich, 1983).

"It is often recognised as short-term elements for them, rather than being seen from long-term perspectives, because here this company is rolling very urgently. So, I felt that it is always difficult. Short term! When I addressed a story with long-term planning, they often talk to me that my head is in the clouds!"

[JH_20; also JC_21]

"Sony makes TVs, right? Now Google TV comes out. Sony, says "oh my god, this is the next system" so Sony makes a partnership with Google, and they say, "We are going to make partnership, secretly between sizable companies. We are going to be partner in 3 years. Then we are going to find our own system."

[VD_9; also EG_9]

This indicates that organizational design practices are not only about 'making an object' as a result of a purposeful material mechanism, but also suggests how to devise human consciousness and inquiry in response to constantly changing human needs.

5.3.5. Overview

This section has demonstrated how elements of enacted organizational cultures affect organizational approaches to digital platform strategies for holistic product and service design.

Scrutinizing digital platform strategies of selected organizations examined how such holistic approaches to design management can be hindered or enabled by elements of enacted organizational cultures: such as, cross-cultural differences; corporate mechanisms; and an organizational culture and behavioural barriers in attention structures, which are related to power and hierarchical structures. These are manifestly reflected in a comparison of Eastern and Western organizations.

This section also underlines the metaphoric and symbolic concepts of organizational cultures, emphasizing human enactment in carrying out generative design practices of designing. This agenda has been missing in scholarly literature in an explanation of holistic design, which has only discussed limited concepts of design practices, such as purposeful actions of organizations (Section 5.3.4).

5.4. Chapter Summary

This chapter presented the findings of this study to examine how approaches to managing design differ in large organizational cultures in the East and the West, which were analyzed in accordance with the dimensions of the map of enacted organizational cultures in design practices (Figure 2).

- Section 5.1 explored different organizational approaches and environments in carrying out design practices and different features of design priorities pursued by large organizations in the East and West. It was found that these could be associated with values inherent to their own design practices, which are adapted into their own organizational and national cultures.
- Section 5.2 provided explanations about the detailed mechanism of enacted organization cultures in organizational approaches to managing design in the East and West. This can be associated with different organizational attitudes towards exploitation of their design practices, which imply different attitudes towards uncertainty or risks. This was proven in different types of organizational concerns regarding their own perceived controlling factors, allocation of resources and time management, which are exploited within a context of power structure in an organization structure that is aligned with a domain definition. In comparison with Western companies, the Eastern organizations' domains are featured in hardware manufacturing. This leads to more concerns about such perceptual controlling factors for exploiting their design outcomes. That exploitative organizational environment has forces leaders and designers to be under greater pressure, which creates a tightly-coupled behavioural organizational structure.
- Section 5.3 demonstrates how the drawn elements that appear in the enacted organizational culture mechanisms have affected the organizations' design outcomes, and digital platform strategies in the cases of the Eastern and the Western organizations: Samsung and Sony, Apple and Google. It shows different features in the development of digital platform strategies; an organization's initial domain definition is interplayed with organization structures and, for some organizations, it leads to strategic confusion between the digital platform strategy that can yield indispensable design outputs and product strategy, causing constant tailoring of organizational approaches to managing design; the East - tipping strategy; the West - coring strategy. Section 5.3.4 presents the significance of the discussion about the elements, regarding organizational culture as a root metaphor to account for holistic design, *designing*, as related to symbolic and subjective design practices.

6. Discussion

6.0 Introduction

Analysis of the key findings provides not only an understanding of organizational approaches to design management in large organizational cultures in the East and West, it will also help readers clarify the nuanced meaning of design management in relation to continually evolving digital materiality and the shifting contexts of organizations. A lack of understanding of actual organizational contexts has been conceptually addressed. This chapter will discuss those contexts more specifically based on the implications of the findings of this study.

A major inference of this study is that from a viewpoint of material-based organizational cultures, such organizational approaches to managing design with regard to *designing* are related to different organizational attitudes against 'risks' and 'uncertainty', which are embedded in an organizational culture (e.g. Zammuto & O'Connor, 1992; Farjoun, 2010). This study shows that design practices for new digital products and services take place in the context of different types of organizational concerns about uncertainties, due to the shifting role of design management and of organizations with regards to the concept of management designing.

This research will also lead us to a new understanding of enacted organizational cultures for designing management. In carrying out design practices, enacted organizational cultures – *designing* - should be viewed from a root of metaphor, which emphasizes human enactment *per se*.

In addition, this chapter will open new perspectives to readers with regard to design research that can embrace actual organizational contexts, as well as the shifting design roles in digitalization. Therefore, this chapter addresses the following:

- **Enacted Organizational Cultures and Designing (Section 6.1)**
- **Distinguishing Approaches to Design Management in the Enactment of Organizations (Section 6.2)**
- **Critical Discussions about Design Research for Design Management Studies (Section 6.3)**

6.1. Enacted Organizational Cultures and Designing

6.1.1. Managing Risks vs. Uncertainty in Designing

In consideration of the relations between product, design and organizational cultures, this study reveals that different approaches to design management in creating new digital products and services are caused by an enacted organizational culture that holds different organizational attitudes towards 'uncertainty' or 'risks' (see the section 2.5.1: also Zammuto & O'Connor, 1992; Farjoun, 2010). This was examined by looking at design practices reflecting different organizational cultures in Eastern and Western organizations.

As noted in Section 2.4.1.2 (see also Langlois & Cosgel, 1993; Chang, 2014), this study reveals that in the examination of enacted organizational cultures in design practices for digital artefacts, the concept of risk is distinguished from uncertainty; although the two terms have been used synonymously in management, innovation and new product development studies. This is the reason why the generative design practices representing 'designing' for digitalizing artefacts are situated in a constantly evolving design environment in response to emerging needs of users and technology that are changing constantly, and cannot be 'predicted' or 'expected' by measurement theories alone. In addition, this is mostly related to human enactment in terms of devising the necessary artefacts and tacit capabilities of an organization to deal with these needs.

In introducing something new in regard to digitalizing artefacts in product or service design, the integration of *heterogeneous* design elements has rarely been addressed in traditional design practices e.g. hardware and software. However, such uncertainties should also be considered along with exploitative elements that ordinary organizations have previously dealt with; explicit considerations of perceptual controlling factors for exploitation (Sections 2.4.3.2 and 5.2.2.3).

In this context, such organizational attitudes towards risks or uncertainty in creating something new for digitalizing artefacts lead to organizational tolerance towards openness in carrying out such unimaginable design practices - creating something new with heterogeneous design elements. Tailoring and crafting organizational approaches to managing design are included in such organizational efforts towards exploitative openness (Sections 5.2.1.1 and 5.2.2.2). This is therefore determined by tacitly accumulated organizational capacities towards such openness that lies in '*designing*'. This is seen differently as an enacted organizational culture whilst embracing such aspects of openness, containing uncertainties along with organizational exploitation.

In relation to the above, the inertia of complexities in design practices is significantly enacted as challenges – from the national level to the individual organizational level in relation to an enacted

organizational culture (see Hannan & Freeman, 1984). This is because of the exploitative elements that formulate material and instrumental organizational cultures. These conventional complexities exist in industrial and economic mechanisms from national to corporate levels, which form parts of an enacted organizational culture in purposeful material practices (see also section 5.2.1). In these circumstances, open, emergent and explorative elements for design are fundamentally hindered by those exploitative factors addressed in material practice mechanisms.

Moreover, it offers a key understanding of dilemmatic but ambidextrous aspects of design in the adaption of organizational capacities to the management of those uncertainties in creating new digital products and services. In actual organizations, idealistic design practices for new digital product and service design – *designing* - are necessarily hindered by such organizations' exploitative considerations; that is, managing predictable and measurable risk.

Whereas, design in action is required of ambidexterity balancing between exploitation and exploration, 'holistic' and 'reductionist' approaches are required to fulfil such an enacted organization's own interest and needs. These are to be shown by looking into an enacted mechanism of organizational cultures in carrying out such generative design practices: i.e. information systems, attention structures and organizational approaches to design outcomes - digital platforms - within a certain organizational structure containing power structures. The central inference of this is an intervention in formal and informal power structures placed in a hierarchically configured organizational structure in managing the increasing complexity of products and services (analyzed in Section 5.2.). This has been illustrated in design practices run by large organizations in the East and West; the East being concerned about risk management in exploitative ways, whereas the West accepts uncertainty in less exploitative contexts. Moreover, it shows different characteristics of the hierarchy of organizational structures that explicitly affect organizational design practices. The East is here characterized as a tightly-coupled single hierarchy; top-down; collective decision-making and particularism; obsession with precision; and exact and replicated formalization activities. In contrast, the West is likely to accept intangible conceptual ideation in a less hierarchical organizational environment. This leads to different types of design priorities: the East is more focused on textual design approaches to viable and feasible design outputs, whereas the West accepts exploratory and conceptual design outcomes (see Section 5.1.4; and Table 5.2).

The differences in Eastern and Western organizational approaches to creating new digital artefacts can be symbolized in the different organizational approaches to the management of 'designing' that lies in growing uncertainties. It also shows how an organizational culture is enacted as inertia when it attempts to create or introduce something new in digitalization.

6.1.2. Enacted Organizational Cultures in the Management of Purposeful Material Practices

6.1.2.1. Organizational cultures for designing in material practice mechanisms

This study illustrates how different features of organizational cultures are formulated and how the approaches to managing design are moulded as an organizational culture within a process of designing for digital technology-embedded product and services. Investigating different features of enacted organizational cultures in actual design practices, two concepts of organizational cultures are broadly identified: concepts of organizational culture resulting from purposeful material practices, and organizational culture as root metaphor (see Section 5.2.1). The distinction between the two concepts is significant in accounting for the creation of digitalized artefacts in consideration of holistic design approaches (note also Section 2.1.3).

The findings of this study illustrate that such dominant concepts of organizational cultures are discussed within the variables of instrumental and purposeful material practices, those based in organizational cultures (i.e. cross cultural and corporate cultures) in explaining design practices for new digital products and services (note Smircich, 1983). Despite the importance of increasing human enactment in explaining the concept of designing for digitalizing artefacts, elements of organizational culture as a root metaphor emphasizing symbolic human enactment have been considered less in organizational culture and design studies in regard to actual design practices (see also Section 5.2.1). The approaches to creating new digitalizing artefacts are, instead, characterized by the exploitation of organizations within such material mechanisms. Interdependent variables addressed in material-based organizational cultures are then to be exploited in enacted organizational culture mechanisms (see also Section 5.2.2). It then makes it possible to discern enacted large organizational cultures in the East and West in their design practices.

At first, from cross-comparative perspectives of organizational cultures, variables situated in national cultures interplay as fundamental roles forming large organizational cultures. This process affects large organizations' subsequent approaches to design practices, being that it affects these organizations' tacit understanding of design, which is formed within a national and institutional mechanism. Prior academic studies are addressed here regarding a relationship between national and organizational cultures ; thus, the tacit understanding of material practices at the organizational level is interdependently affected by factors, including the level of national economic growth and levels of education attained by design professionals (see also Section 2.2.3; 2.2.4; e.g. Hofstede & Bond, 1988; Hofstede, 1994; Hofstede et al., 2010; Tellis et al., 2009). Such institutional variables at the national level are interdependently enacted in carrying out organizational design practices, from individual design professionals to large organizational approaches to managing design by shaping different types

of organizational attitudes towards their design practices (see also the Section 5.2.1.1.). Thus, meaning that organizational approaches to managing design can take place with fundamentally different grounding in material practice.

The inference is that viewing organizational cultures from material-based perspectives, all such enacted mechanisms of organizational cultures subsequently participate in carrying out design practices i.e. a national culture has an impact on more than individual organizational cultures. However, different approaches to managing design are also a result of different socio-metric structures amongst individual design professionals. All these structures can be enacted as a hindrance or enabler in achieving holistic design. The cultural ambience relating to such material mechanisms is therefore influential in creating new digital artefacts that contain unprecedented complexities.

Based on this understanding, the next section will more specifically discuss the relationship between national cultures and design practices.

6.1.2.2. Different approaches to managing design: the East and West

With a focus on enacted organizational cultures situated in material practice mechanism, there are different patterns of approach to managing design in the East and the West. This can be seen to be associated with the differences in when industrialization occurred and how rapidly; factors which are aligned with their respective economy growth. The different features of organizational cultures in creating new products and services clearly exemplify this (Sections 5.2.1 and 5.3.2.1).

First, in creating such advanced technology-embedded products and services – i.e. new digital products and services - organizational capabilities are closely associated with deeply rooted technical capabilities within a supportive industrial mechanism, rather than individual's purely ego-based crafting and artistic skills (Table 2.1. in Section 2.1.4). Hence, much significant knowledge and learning is required to oversee all product and service systems from holistic perspectives (Figure 2.3 in Section 2.4.2). In this sense, it is important to understand how one nation has approached its material practices in sociotechnical contexts; that is, in *exploitative* or *explorative* approaches. A nation's level of economic achievement and the ways of approaching its material practices are significant for an organization in a national context, in order to accumulate such significant design capacities and to learn how to exploits its design practices (e.g. R&D capacity). Moreover, a nation's particular ways of progressing its economy are interrelated with how large organizations learn such tacit design capacities. For instance, incremental economic growth in the East Asian countries could be achieved by optimizing exploitative approaches from organizational level to individual talents. It is shown in the strong alliance between large organizations and governmental policy; family owned business model; and standardized talents fitting to such linear manufacturing process.

In fact, East Asian organizations have followed in the wake of Western approaches owing to their comparatively late start (see Section 5.2.1; also Section 5.3.2). Raising their level of talent has been a key concern for them in order to develop efficiently based on exploitative learning skills, and thus driving massive manufacturing capacities that can generate vertically coupled hardware products efficiently. This approach can also be related to the distinctive organizational cultures featured in collectivism and higher power distances amongst members of an organization, which could have fostered such exploitative elements (Section 5.2.1.1). Their nurturing of a philosophical value system such as Confucius ensured that collectivism and higher power distances could have played such central roles in terms of achieving nominal growth by keeping abreast of those talents for engineering and manufacturing, rather than the use of explorative and reflective capability (note Sections 2.2.4 and 5.1.1; Hofstede & Bond, 1988; Kao, 2009).

On the other hand, design practices for digital technology-embedded products and services – i.e. *designing* - are required for both the capabilities of exploration and exploitation in dealing with such uncertainties. Designing is not limited to learning through the separation of relevant disciplines in reductive approaches, since digital materiality entails heterogeneous design elements – hardware and software – in the cultivation of openness. To deal with this, organizational considerations about designing should move towards symbolic and reflective design practices. Holistic approaches to managing design are accomplished based on these grounds. However, such exploitative grounding of large Eastern organizations can to some extent be paradoxical in creating new digitalizing artefacts.

Next, interdependent variables addressed in national cultures include all the supportive systems that can foster and synthesize such heterogeneous design elements at the organizational level (Sections 5.2.1.1 and 5.3.2.1). Supportive policy, capital systems, research infrastructures and human resources constitute the fundamental grounding that can optimize symbolic and reflective design practices for designing – from organizational to individual professional design level. For instance, the results figured in the global entrepreneurship index can represent one nation's industry ecosystem, so indicating how heterogeneous types of businesses can be created and regenerated at the national level. It can then show how these can contribute to forming platform complements in a digital ecosystem aimed at creating digital new artefacts as a whole (see also Section 5.3.2.1). This inherent national grounding can create new needs and opportunities for both design professionals and organizations to deliver their capabilities to these domains.

In line with the issues outlined above, the next section will discuss how corporate cultural elements can be enacted in design practices.

6.1.2.3. Approaches to managing design in a corporate cultural mechanism

As the technology adopted in actual design practices becomes complex, organizations also require more complex administrative structures through which organizations can manage the complexities that contain uncertainties. Organizations become ever more complex by adapting and tailoring ways of achieving standardization and specialization to the process of creating new artefacts. This is undertaken within its own organizational structure. The contexts and texts produced in carrying out new product development and design projects are therefore manifestations of such complex organizational actions (Section 5.2.1.2; note Section 2.3).

However, whilst managing such complexities in organizations, all such actual concerns are closely associated with organizational exploitation, underlined in all kinds of design practices. Accordingly, this affects attitudinal and behavioural elements of organizational structure in design practices. As noted earlier in Section 6.1.1.1, challenges are viewed as significant in carrying out the creation of new artefacts at the organizational level. This is all related to how an organization manages risks to ensure that they are predictable or resulting in the uncertainties that often undermine organizations.

As discussed in Section 6.1.2.2, the challenges that organizations face at the corporate level are clearly shown in cross-cultural comparisons between East and West, in terms of how they undertake organizational design practices. This is one reason why national corporate cultures are to some extent subsequently adapting to a national grounding in undertaking their complex material practices as design practices.

Firstly, in the East, there is a possibility that large organizations can utilize collectivism and higher power distances in effective ways. This would effectively collect incremental human power to assimilate incremental technological knowledge through keeping abreast of those talents who can use their specialized design capability (see also Cohen & Levinthal., 1990, pp. 140- 141). The above can be achieved through a certain level of explicit and technical knowledge in applying reductive approaches in a short time by using collective rationale and utilizing competitively coupled tensions between professional members through the close supervision of a series of powers in the organizational structure.

However, this model rather underlines how to manage perceivable risks when developed through collective endorsement at a corporate level (see also Section 5.2.2.3). This model therefore has limitations in terms of accumulating tacit organizational capacities that deal with incremental uncertainties; involving designing that is based on tacit understanding of the combination and assimilation of heterogeneous design elements. In introducing new artefacts, it is far more important to consider and be concerned with measurable risks and viable outcomes due to the collective tensions across its organizational structure.

In fact, the design of new digital products and services is accomplished by a different depth and level of heterogeneous types of knowledge that are tacitly transferred and accumulated (Section 5.2.2.3). In integrating all such heterogeneous elements into a digital product as a whole, the lack of understanding of detailed and reflective knowledge about heterogeneous elements may cause significant deviations. The causes of deviation can occur in a process intended to reduce the risks. In transferring such knowledge, a complex administrative structure is exploited, being that more explicit consideration is given to its perceivable factors in leading to financial benefits through reducing costs and timeline. This ensures that its information system structure is interlinked with a certain power structure that is aligned with a specialized and standardized organizational structure (Sections 5.2.1.2 and 5.2.2.2.; and Section 5.2.2.3.1).

Next, this study gives consideration to cross-cultural elements in the East and West. At the corporate level, significantly scarce attention has been given to such strong collectivism and higher power distances (the East Asian model) in that they have never recognized (experienced) before (i.e. uncertainties). A vertically integrated organizational structure fitting to single hierarchical product architecture is likely to adhere in its own enduring manner to its own design approaches ((2) in Section 5.2.2.3; (2) in Sections 5.3.3.1 and 5.3.4.1), being that their superiors' professional capacity is likely to be coupled with its design approaches (Section 5.2.1.2).

To some extent, tightly-coupled collectivism and higher power distances in the East Asian organizations may distract from operations of 'designing' in creating generative digital artefacts. In such a cultural environment, the extent of informal power structure has expanded according to professional members' behavioural structure; here, not only limited to normative and formal structure. Due to the implicit concerns about the given powers surrounding design professionals, measurable risks for feasible design outcomes have been more frequently discussed, being that it is not easy to collect, with rational reasoning, consensual agreement for unmeasurable and unaccountable concepts of design in such exploitative power webs (Section 5.2.2.2).

This corresponds with the results of prior organizational culture studies in which Eastern Asian organizations are featured in terms of demonstrating a greater tendency towards uncertainty avoidance (Hofstede et al., 2010).

The following sections will discuss how holistic approaches to managing design in creating new digital artefacts can be differently approached in enacting organizational cultures.

6.2. Distinguishing Approaches to Design Management in Enacted Organizational Cultures

6.2.1. Domain Definitions and Inherent Design Methodologies

This study demonstrates how organizational cultures are enacted differently in reference to large organizations' design practices when creating new digitalizing artefacts - digital new product and service design - in accordance with the map of enacted organizational cultures (Section 5.2.2). Looking at the features of enacted organizational cultures reflected in the design practices, this study reveals that different approaches to managing design in organizations are, to some extent, deeply rooted in initial domain definitions and inherent design methodologies. These all affect the formation of parts of enacted organizational cultures in carrying out such design practices.

First, it has been clearly illustrated that there are different initial domain definitions in the East and the West – most significantly in large organizations . This has caused the formation of different types of organizational structures (see Sections 5.2.2.1 and 5.2.2.2) where the configuration of organizational structure is likely to be in alignment with initial domain structure (see Section 5.3.3.1.1). In carrying out complicated design practices, organizational approaches to managing designs are thus interlinked with an organization's own design methodology that has been accumulated from its early domain definition (Section 5.2.1; 5.3.2). In this sense, considering the different period and speed of economic growth in the East and the West, large organizations' domains in the East and the West have already been determined by their given national circumstances (see Section 5.2.1.1.1). The business domains and perceptions of design practices in the East and West could already have been initiated in such different domain definitions.

Second, a domain definition implements its own design methodology and adapts this to its own design practices. However, in creating new digital artefacts, this causes significant territorial issues between hardware and software, which come from early domain definitions of organizations. This study will examine the above by looking at the cases of the Eastern and Western organizations' design practices for introducing new digitalizing artefacts; that is, focus on hardware manufacturing in the East, and software system production adopted in the West (Sections 5.2.2.1 and 5.3.3.1). Each domain has accumulated its own design methodology in accomplishing its own design outcomes (see also Table 2.1), aligned with its own accumulated technical knowledge for creating such complex artefacts (see also Section 2.5.2.2).

In this context, one firm's tacit design capacity to create new digital artefacts is reflected in how it assimilates such heterogeneous design elements rooted in such different domains, and in determining how to craft its strategic approaches towards its design practices. In different territorial domains, such

issues therefore provoke the use of a firm's design methodology. In generating design outcomes at an organizational level, this firm's early domain definition of an organization has optimized its own organization structure in alignment with its specialization and standardization disciplines for its own domain products and services. Its design methodology is therefore aligned with its own domain definition.

This case can specifically illustrate the relationship between design prioties in the East and West and their domains (see Sections 5.1.4 and 5.2.2). For engineering-based hardware manufacturers, one deviation is critical in a design process as it is likely to cause other severe 'perceivable' risks that can affect an otherwise tightly arranged vertical product design system. Therefore, approaches to managing design are likely to be seen as explicit 'resource'-based approaches i.e. exploitation. This is demonstrated in the selected cases from the East, addressed in Sections 5.2.2 and 5.3.3. Although they attempt to develop new products and services by embedding digital technology, they show a lack of understanding about convergence and generativity in carrying out these design practices, and in the designing itself.

Hardware domains in the East tend towards too much concern for objectified, measurable, predictable, accountable, explanatory and structured reasoning and its outcomes. This tendency is generally followed by other tendencies towards preferring tangible 'design outputs', related to their tangible mechanical and elctronic design outcomes. The design practices are thus accomplished by reducing all anticipated risks that have been previously perceived (Section 2.1.3 with Section 5.2.2.1).

In contrast, organizations characterized by software-like approaches (i.e. the West) are likely to consider exploratory approaches in creating products and services. The design practices will usually run through loosely-coupled domain structures in order to embrace all unexpected, unpredictable, unmeasurable and blunt problematic situations between logic and actions, because it should deal with a huge influx of decentralized information regarding both immaterial and material elements before initiating their business (see Section 5.3.3, and also Sanchez & Mahoney, 1996).

This analysis provides more clear evidences about 'why' East Asian organizations are likely to tend to prioritize adding features and material outcomes in carrying out new product and service design practices. This approach can be closely associated with their formal and explanatory communication style, along with a presentation of prominent visual design concepts. In contrast, Western organizations are not likely to do so (see Table 5. 2).

6.2.2. Inertia of Enacted Organizational Culture in Designing

Enacted organizational cultures, reflected in a process of creating new digital artefacts, have been seen as demonstrating *inertia* in creating new digital artefacts along specific domains. The findings of this study offer key insights into the relationship between enacted organizational cultures and organizational approaches to 'designing'. In explaining the concept of designing for digital technology-embedded product and services, concepts of organizational culture have come to elaborate an evolutionary and generative design of product and service, as well as organizations from *artefaction* perspectives (see Section 2.1.2). Such features of enacted organizational cultures in design practices are thus characterized by organizations' inherent norms, attitudes and values towards how they manage to confront *risks* or *uncertainty*, and *exploit* or *explore* these within a certain power structure of organizational structure (Sections 6.1.1 and .1.2.3). Within this context, the inertia of enacted organizational cultures affecting design practices is found in two areas; namely, ***domain inertia,*** and ***inertia of domain organizational structure***.

Domain inertia: as discussed in section 6.2.1, the formation of an enacted organizational culture in '*designing'* in action, is associated with an organization's initial domain definition and this causes enduring *domain inertia*. This appears in crafting organizational capabilities and assimilating heterogeneous design elements into one digitalizing product and service as a whole – i.e. integrating elements in software and hardware design into a digital new artefact as a whole. However, the separation of design disciplines nurtured through a different early domain has caused severe organizational challenges in tailoring approaches to managing design in response to constantly evolving generative digital technology-relevant design practices. This approach acts as structural inertia in approach to these complexities, shifting organizational structures and tailoring approaches to managing product and service design (see also Hannan & Freeman, 1984; Reeves et al., 2015). Within such circumstances, the organization tends to focus on things that they have addressed before as uncertainties or unprecedented processes, in order to create new artefacts that are not able to be explicitly measured according to its own organizational logic. Hardware manufacturers (often occurring in large East Asian organizations) have perceived software elements as peripheral or additional elements, rather than recognizing coring values (see Section 5.2.2.1). In terms of digital platform strategies, the Eastern organizations tend to lean towards resource-oriented strategies - i.e. tipping platform strategies by exploiting existing hardware product lines (Section 5.3.3.3.1).

Inertia of domain organizational structure: unlike concepts of cultures addressed in anthropology (Hofstede et al., 2010; Smircich, 1983), the features of enacted organizational cultures in design practices are often addressed in their own material practice mechanisms and so this is explicitly reflected in its organizational structure from an artefaction perspective (see Section 2.3.4). In this context, this study found that the featured enacted organizational cultures have adapted themselves to

be aligned with a certain web of power structures in an organizational structure. These powers or capacities in an organizational structure are characterized by how they manage uncertainty or risk in creating new artefacts. The instrumental results of organizations' design practices thus, to some extent, conceive of significant impacts on entire organizational structures, meaning normative and behavioral structures. Existing properties that lie in a normative structure in managing design practices (e.g. information transfer and formalization in attention structure) are adapted to newer approaches to managing design for creating new digital products and services along with existing ways to manage such complexities, such as standardization and specialization through departmentalization (Chang, 2009; Yoo et al., 2010; Scott, 1998; Mintzberg, 1983).

However, in the case of enduring hardware domain, the organizational structure is explicitly aligned with its standardized manufacturing processes, the distribution of roles of design units into specialized tasks, then aligned with their own hardware product design parameters. Thus, the structure is shaped through an alignment with tightly-coupled and single hierarchical hardware product architecture.

On the contrary, this structure is to be contrasted to the shifting design rules of digitalizing artefacts, which are created and regenerated through decentralized information structures through multiple layered modular architecture within a loosely-coupled organization structure (Section 2.4.3.1; Yoo et al., 2010). Moreover, the administrative structure in an organization is adapted to the logic of early domain definition that the earlier power structure has appeared to exploit and sustain its existing properties. Hence, the organizational structure is characterized aligned with structures of the given power within the contexts of the early domain definition.

In carrying out improbable design practices to create something new, the inference is that a wholly organizational approach to managing confronting risks or uncertainty is therefore rarely detached from an early domain definition as concerned with serially interlinked powers in an enacted organization (Section 5.2.2.2).

However, such implicit concerns regarding inertia in enacted organizational cultures are more critically depicted in behavioural structures, looking at large organizational cultures in the East and West. The next section will therefore discuss the detailed political mechanisms reflected in behavioural structures.

6.2.3. Enacted Attentions on Political Manoeuvring in Behavioural Structures: From the Eastern and Western Perspectives

In carrying out design practices for creating new artefacts, organizations are inevitably situated in relation to political concerns with all kinds of explicit managerial issues, such as allocation resources, meeting timelines, and demands of top management etc., which lead to exploitation (see Greenbaum & Kyng, 1991; Baker et al., 1988). However, the enacted attention structure mechanism placed in the behaviour structure, which could appear in actual organizational design practices, has rarely been discussed before. Looking at the approaches of large Eastern and Western organizations to managing design, they appear to feature differently in informal layers of power structures that appear in certain types of hierarchical organizational structures when carrying out complicated design practices. This section will recap on these features by using the findings of this study and construct the scenarios according to domain definitions (see Table 6.1). The major concerns about such political attention in design practices include the following:

Political tensions in behavioural structures reflect differently characterized types of organizations, such as domain definitions. This is clearly shown when looking at national cultural environments in the East and West in which large organizations' complex design practices take place. In comparison with Western organizations, Eastern organizations are likely to be more concerned with such political tensions. The distinctive characteristics of collectivism and higher power distances could have helped to exploit collaborations and partnerships along with channeling leaders' internal empathy (Section 5.2.1.2.; Davis et al., 1997; Sundaramurthy & Lewis, 2003,p 389). However, in consideration of the currently decentralized design environment for digitalization, such features can be challenges in terms of tailoring their approaches for managing increasingly complicated design practices because such constantly changing inquiries coming from digitalization must be legitimated by the multiple and complex webs of hierarchical authorities. However, this is seen across all the normative and behavioural structure of Eastern organizations. Their significantly fragmented organizational structures, aligned with their intrinsic power structure, may cause a delay in significant decision-making in tailoring those strategic approaches. As design processes and corresponding practices become complicated, much is required of uncertain explorations in order to ensure that these design practices meet all the holistic enquiries (Sections 5.2.2 and 5.3.4).

The political tension is also associated with an enduring domain definition aligned with a nation's mechanisms for their material environment. When an earlier domain definition is aligned with such a massive institutional mechanism, such as national economy growth and industrial ecosystems, it requires an organization to maintain its own domain definition as it attempts to hold on to existing properties yielded from its own dominant domain.

However, this causes political tensions once newer organizational approaches appear necessarily to create different types of new artefacts i.e. in creating digital new artefacts. In the case of East Asian organizations, the dominant hardware domains could have been achieved by incremental collective actions and exploited by higher level of power controls, leading to a closed industrial ecosystem along with national economic growth (Section 5.3.2.1; 5.3.3.1).

However, these become characterized as vicious political manoeuvres, being that the initial success of one organization is still needed to exploit the needs for accomplishing design practices that have become competitive (Sections 5.3.4.2 and 5.3.4.2; see also Davis et al., 1997). In the case of hardware manufacturing by East Asian organizations, their attentions have been focused on exploiting measurable and predictable design outputs and this has been accomplished in terms of meeting short-term expectations of top management and of the collective interest (Sections 5.2.2.3 and 5.3.4). For this reason, their authorities have paid a lot of attention to generating viable outputs in order to maintain its continuing success in similar ways. So their manner of formalization is often concerned with explanatory reasoning to achieve the best exploitation (see Section 2.4.1.3 with Section 5.1.3.2). In the initial stage, in order to build one's own domain definition, designers may initially foster their collaboration with its collective rationale by keeping abreast of incremental technical knowledge in order to exploit their design capacities for making existing artefacts with little reflective action (Sundaramurthy & Lewis, 2003; Cohen & Levinthal., 1990; Hannan & Freeman, 1984). This could also be accomplished by a collective rationale because few authorities' decision-making is currently efficient in taking a reductive approach. However, it may cause collective tensions to arise between authorities and, as it turns out, implicit controlling factors that come from multiple watchdogs – external and internal organizations, national surroundings and internal members – at an invisible behavioural level, where initial stewardship is therefore suppressed (Sundaramurthy & Lewis, 2003, p.404).

Based on the above understanding, it is important to consider how such political attention in behavioural structures can impact upon creating digital new artefacts. In particular, for hardware manufacturers, the central issue that lies in such an enduring domain definition is their tightly-coupled approaches to managing hardware design in tailoring these strategic approaches in response to a constantly changing digitalization environment. Therefore, such long-term hardware manufacturers in the East Asia are tempted not to perceive unpredictable and unmeasurable things that lie in the convergence of heterogeneous design elements. This causes a severe lack of attention in managing a design for new digital products and services (see also Sction 2.4.3.3). Tight censorship between authorities and such distinctive organizational attitudes - collectivism and higher power distance - causes dilemmatic tensions; it is tempting for them to pay too much attention to existing, measurable and predictable issues to sustain their powers in their own power structure (Section

5.2.2.2). Accordingly, previous successes driven by exploitation become mutual burdens across the power structure.

Such processes are disassociated with genuine empathy towards given design practices, and has little to do with holistic design approaches, *designing*. Under these circumstances, explicit considerations of financial benefits were carefully considered in design practices in such traditional approaches: concerns about timeline management; allocation resources for exploitation; and design outcomes have been delivered in explicitly fragmented ways to meet spontaneous needs that occur at a specific moment. Hence, managing perceivable *'risk'* is much prioritized.

On the other hand, software-like structures that appear in Western organizations show detachment from such complicated political concerns in their behavioural structure. In particular, the domain definitions of those Western organizations have not been coupled with exploitative national economic policy for rapid growth (Sections 5.2.1.2 and 5.3.2.1). Their organizational structures are thus configured and integrated along with their own genuine domain definitions and the leaders' own visions that define the domains. Therefore, attention paid to structures by designers shows them to be decoupled from such complicated political tensions.

Lastly, this study has also found that it is possible for individual designers to also exploit their organizations (see also Section 2.5.4.4.), relating to members' socio-metric structure in taking their reflective design actions (see also Section 5.2.2.2.2). This was shown in designers' attitudes in the East and West. In large Western organizations, the characteristics of individualism and smaller power distances can enable the fostering of individual designers' extrinsic motivation and opportunism in carrying out their design professions (see Section 5.2.1.1.3; also Sundaramurthy & Lewis, 2003). However, such methods are not always useful for driving holistic design approaches because individual designers can also exploit their design practices by looking at an implicit manner of communication leading to an enacted attention structure (see Section 5.1.3.2). If an organization's goals cannot meet an individual member's opportunism in carrying out those complexities, it is difficult for such an organization to manage such talents and balance its exploitation and exploration in order to accomplish the best design outcome. Since not as much collective tension and censorship exists, compared to the East, then some individual designers' exploitative attitudes will be expressed and this can cause an indulgent organizational atmosphere in approaches to managing complex design practices (see Section 5.1.2.1). Yet, if an enacted environment can face up to the opportunism of these individual members', then genuine interdisciplinary design practices can take place with little concern about political manoeuvring; that is, exchanging individuals' own interest and tacit understanding of heterogeneous types of knowledge in regard to assimilating all kinds of individual professional capacities. This approach can also overcome typical organizational territorial issues - e.g. hardware vs. software or engineering vs. design.

In conclusion, enacted organizational cultures are featured differently in new approaches to managing design, new digital product and service design. This difference is, to some extent, characterized by politicized organizational structures that are situated in complicated, unprecedented and competitive design practice environments in creating digital new artefacts. However, those have been discussed from the perspectives of material-based organizational cultures.

The next section will discuss the significance of studying organizational cultures as a root metaphor from interpretative perspectives. For this, Hofstede's research approach will be discussed. This will be useful to explain newer approaches to generative design practices in creating new digitalizing artefacts.

An organization domain situated in	Explicit considerations addressed in design practices	Manifestations	Reflected attention structures
Hardware manufacturing in the East Asia • Situated in collectivism and higher power distance • Power structures are fragmented as aligned with diversified hardware product lines in vertically integrated organizational structure	• Inputs perceived as cost in managing design • Concerned with constraints of timeline to keep up with regulatory product cycle • Approaches to managing design addressed in tactical level to meet shorter term expectation for exploitation	• Diversification of product lines prioritised • Launching time of new product and service is prioritised • Explanatory rationales in information system are compelling for exploitation	• In brevity, quantified, mathematical and numerical evidences are expected • Informal power in single hierarchical organization structure distracts design professionals' commitment: to cause political manoeuvring • Concerns about scarce attention and absence of attention to uncertainty
Software design in the West • Situated in individualism and smaller power distances • Power structure focused on a domain definition along with leaders' vision	• Inputs in managing design are nearly zero cost due to the nature of software design • Unprecedented problems are always underlined: Managing design addressed at the strategic level from long term perfectives in response to unmeasurable uncertain and problematic situations	• Diversification does not necessarily involve strategic approaches • Design professionals consider exploration in response to the fundamental logic of software design	• Not necessarily quantified; rather qualified based on universal logic • Powers as guidance or supervision for quality design outcomes: lower political tension • Lack of controlling elements due to loosely coupled structure

Table 6.1 Enacted attention structure scenarios by domains in digital new product and service design practices (also adpated from Hwangbo et al., 2015b)

6.3. A review of Hofstede's dimensions: for design management studies in the era of digitalization

6.3.1. Organizational cultures in design studies: embracing interpretative perspectives

In organisations engaging in complex design practices (here, for digital artefacts design) increasing psychological concerns of staff members (designers and relating professionals) are evident as the design tasks and practices become complicated, involving constantly changing uncertainty (also see Perrow, 1986; Argyris & Schon, 1996). Design practices for digital artefacts design thus significantly underline the study of behavioural aspects in actual organisational settings. However, organizational culture studies in design studies have been instrumental with little considerations about symbolic and metaphoric human enactments in the complex material practices (also Section. 2.3.3. & Section 2.5.3.3). In terms of this, Hofstede's research (1994;2010) that is broadly applied to this thesis (see Section 2.3.4) will be reinvestigated because his research could be approached from such instrumental perspectives and the findings of this study show that his results are not fully corresponded with material practices for digital artefacts design and the organisational environment.

First of all, despite the emergence of multiple concepts of organizational cultures (Section 2.3.3), Hofstede's research does take less account of multiple concepts of organisational cultures (instrumental and interpretative perspectives) and shifts of material practices aligned with technology development (also see Hofstede, et al., 2010; e.g. p.150 & p. 358). These instrumental approaches may come from the previously dominant concept of a hierarchical model of management for creating a single hierarchical product design and it shows limitations to discuss leading edge technology and organisational environments. Studying design on organization and the practices has been also addressed within such limited instrumental approaches. Managing design has been presumably dealt with as part of managerial tasks that are undertaken in a hierarchical model of management belonging to a larger system of organisation (Best, 2006). The design studies have looked for how to deal with physical, tangible and explicit product design in line with a manufacturing process (Ulrich & Eppinger, 2012); such as styling, adding physical features, product line variations and marketing & branding in such conventional design approaches (e.g. Person, et al., 2008; Karjalainen, 2003; Karjalainen & Snelders, 2010). Within the context, design, innovation and NPD studies relating to organizational culture and cross-cultural comparison studies too, arguably, have been instrumental by replicating Hofstede's measurement theories and the means (e.g. Song & Parry, 1997; Lee, et al., 2000; Person, et al., 2008). However, those are neither able to explain symbolic human factors in carrying out complicated design practices in actual organisational settings. Staff members' concerns that involve increasing heterogeneity (knowledge domains, informants and organisations), openness

and generativity are hardly explained with such positivists' instrumental approaches in design management studies (Section 5.2.1.3; 5.2.1.4).

In this sense, Hofstede's studies (1994; 2010) are confronted with vulnerability issues, due to the fact that his study broadly applies strong positivists' approaches (survey methods and correlation test)(Hofstede, et al., 2010 pp.28-33; see also Oppenheim, 1992; Easterby-Smith, et al., 2012). Despite the great contribution to development of cross-cultural and international studies (Usunier, 1998; Easterby-Smith, et al., 2012) this is still being in controversy in terms of generalizability issues, being that they are concerned with debates about 'differences' and 'similarities' (see also Section 2.3.3 and note Section 3.2.2). Findings of this study show the vulnerable factors as following.

In fact, Hofstede's research (2010) attempted to conclude that East Asian organizational cultures are rooted in a society-oriented more towards the longer term, emphasizing a long-term perspective and leading to longer-term results in their manifestations, as opposed to shorter-term orientation of Western cultures (e.g. the US) or those that result in shorter-term results (ibid; p.240). On the other hand, apart from the multiple implications on family and social life in his research, the result on the business dimension could not be always shown consistently provided different conditions of material practices; especially, if such linear senses about material practices are not applied. Digital artefacts design and the design practices in actual organisations prove this. In a case of managing design in creating new digital artefacts, the Eastern organizations are more focused on existing, perceivable and measurable material practices in their design practices. The aim is subject to meeting short-term expectations of the organisations- i.e. exploitation. This has also resulted in shorter-term results in terms, for example, of tipping platform strategies as the design outcomes (see Table 5.10). Whereas the Western-based organizations (from the US) have given more attention to exploratory approaches to their design practices and outcomes. The latter has rather resulted in much longer-term oriented design outcomes - i.e. coring platform strategy (Sections 5.1.4 and 5.3.4; and see also Table 5.10). That result is opposed to the Hofstede's implications about East Asian business management style (ibid; p 244).

Next, there is an obscure definition of Hofstede's research framework that is not easily explained in the digital realm. A dimension of 'Masculinity vs. Femininity' is included in this. In fact, he also added that the dimension had been in controversy in terms of labelling and the adaption to a research. The label is not only about gender issues in work places as the label indicates (Hofstede, 2010; p.144); but also implies multiple aspects regarding rules and roles applied in workplaces and societies by using the symbolic metaphors: assertiveness vs. modesty (Hofstede, 1994; Hofstede, et al., 2010). Within its own definition, Japanese and Chinese organizations are featured in masculine workplaces, which is characterised decisive and aggressive (Hofstede, et al., 2010, p.170). On contrary, this study reveals that organizational attitudes in digital product design projects is more obscured in the Eastern

Asian organizations including Japanese, Chinese and Korean firms. Such institutional rules are blurred. Their emphasis is on personal relationship and informal power structure within own tightly-coupled organization structures as design practices involve uncertain complications coming from heterogeneity and decentralisation. And it leads critical political manoeuvring in complex design practices.

This study underlined design studies should weigh to focus on behavioural aspects in actual organizational settings to understand human members engaged in complex design practices and the organisational enactment from interpretative perspectives. It will also lead to understandings of symbolic elements of complex design practices (see also Sections 5.2.1.3 and 5.2.1.4).

6.3.2. International organizational culture studies for design and digital product innovation

From international and cross-cultural perspectives this study brings new understandings about strong ties between organizational cultures and complex design practices in terms of digital artefacts design that is shown evolutionary aspects. The major implications can be discussed by comparing to implications from Hofstede's research outcomes. Hofstede (2010; p456) noted the evolutionary perspective for future organizational cultures studies as considered about increasing complexities of humans' material practices (technology development and civilization) and those of organisations in terms of material ecology. This is addressed based on understandings of biological mechanism in an evolutionary process: natural selection; specialization and the complex interdependencies between species (Hofstede, et al., 2010; p.433) as recently orgaization and business managmeent scholars underlined: biological mechanism are akin to evolving increasingly complex business environement and the adaptive system alingned with technology development (e.g. Reeves, et al., 2016). However, those still lack explanations about how a specific person's discipline and practice, such as digital artefacts design, can be interrelated with organizational cultures from international perspectives. In this sense, this thesis provides useful insights for future design management studies.

Firstly, design practices for digital artefacts design in actual organisational setting are those that represent dynamic human enactments, which involve evolutionary material practices. This thesis demonstrated that material practices being in an evolutionary process should be considered about both instrumental and interpretative aspects. Organisational cultures studies for this study domain cannot be solely instrumental but they should embrace interpretative perspective. Findings on symbolic and metaphoric aspects in digital artefacts design in actual organizational settings can prove this: different subjective concepts of design in organizations' cognitive networks; and unconsciously shared symbolic meaning of design in organizations (see Section 5.2.1).

In this context, future design management studies should reconsider the changing environment and the complex adaptive mechanism from international perspectives. When looking into design practices for digital artefacts design, this thesis reveals globally increasing heterogeneity, changing uncertainties, and the complicated adaption process in those design domains (also see Reeves, et al., 2016; Lyytinen, et al., 2015). Globally decentralised digital platform and ecosystem can provide new opportunities for international stakeholders to carry out their design practices, but at the same time it disrupts organisations' traditional ways of controlling in their own complex design practices . On one hand, organisations need to carefully consider about how to tailor formal organisation structure and instrumental approaches to managing design (Reeves, et al., 2016; Reeves, et al., 2015), but on the other hand, it should be also considered about dynamics of human enactments that are situated in globally competitive international business, organisation and design environment. By contrast, design management and relating studies such as innovation and organisational learning have not provided enough explanations on such complex adaptive system of organizations in changing global design environment in the digital age. Although a few those relating studies have addressed issues in complex design practices from international perspectives it has been approached either within conventional understandings of traditional design principles- single hierarchical modular architecture and the product design or within which it praises a specific design approach of one side of the East and West: for instance, successful innovation in electronics industry on eastern Asian organizations (Hobday, 1995; Hobday, et al., 2004) ; success of innovations in Japanese electronics, automotive and chemical industry because of better tacit learning capacity of Japanese firms comparing to the western (Nonaka, 1995; Nonaka, 2007).

Beyond the above, future design management studies should consider about multiple aspects of changing design environment and human factors in complex design practices in terms of actual organisational settings by bringing broaden international perspectives. Firstly, complex design practices gets involve much complicated knowledge creation activities relating to increasing heterogeneity and uncertainty which come from dynamic digitalisation. In actual organisational settings for the design practices, diversity and heterogeneity tolerances should be considered inside organisations as well as outside organisations from international perspectives. This is about whether or not a group, unit or organization can embrace multi-level of heterogeneity (knowledge domains, informants, and individual design professionals' expertise) in configuring design elements for creating new digital artefact (Section 5.1.1.1; Section. 5.3.2.1). Secondly, design management studies should take into account characteristics of key design disciplines to deal with leading-edge technology and the design domains. Otherwise it is hard to manage increasingly complicated heterogeneous design elements that are applied to a specific design practice in integration of them. For instance, this study found that Hofstede's research dimensions and the research outcomes are not suitable to explain about digital artefacts design and the design practices as his research outcomes mention a broad range of

material practices with obscure understandings of those. This study, however, reveals that large power distance and collectivism followed by uncertainty avoidance can be not competent to achieve digital innovation, unlike Hofstede ‘s argument of success of the east (also see Hofstede & Bond, 1988). On contrary, these aspects can be useful to achieve different types of innovation such as incremental innovation and specific design discipline, for instance hardware manufacturing and the product design (Section. 6.2.3). Depending upon design disciplines accomplishments of design, innovation and design practices of organisations can be differently interpreted. Yet, misleading implications of those can provide wrong implications in practices. Following this, Hofstede’s research framework(2010) should reinvestigate its research dimensions to elaborate details of organisations’ competitive profiles in approaches to material practices and a specific area of design practices. For instance, the relationships between uncertainty avoidance, power distance and collectivism and individualism (e.g. p.218) are not perfectly matched with organisational capabilities for digital artefact design. Especially, generalisation of uncertainty avoidance between nations are risky, and it needs to be articulated for new material practices(digital artefact design). No organisations want to be disrupted either by uncertainty or by risk in any design processes in actual organisational settings(see Section 4.2.1; and 5.2.1.3). Yet, as complex design practices are situated in decentralised and loosely coupled environment organisations may tend to characterise their design problems differently between ‘risks’ and ‘uncertainty’ to certain level. Yet, Hofstede’ research shows obscure definition between uncertainty and risk, so that it doesn’t provide clear explanations how an organisational context and organisational culture can be more competitive than other rivals in a specific design discipline and design practice or how an organisations approach design inquires in a process of recognising design problems . This thesis however underlines that the design approaches can differ depending on how an organisation perceives design problems and issues and there can be levels for an organisation to see risks or uncertainty. Yet, the differences of the level can be varied depending not only on organisational cultures (the east and west or nations) but also on domain definitions(hardware and software) and most importantly given environment (market and technological changes etc.).

6.4. Critical Discussions about Design Research in Design Management Studies

This section discusses how new approaches to design management should be studied in this landscape of digital innovation. This discussion is also about how studies of organizational cultures can contribute to drawing new attention to generative design practices and designing in organizational contexts. It also aims to consider human enactment that lies in actual design practices in organizations; that is, those beyond rationality-oriented organizational concerns.

6.4.1. Platform Strategy as an Organizational Design Outcome

The analysis of organizational design outcomes conducted in in this study has provided significant evidence of how approaches to design management in organizations can differ by examining large organizations. Yet, design management studies have scarcely discussed the use of such evident empirical data sources as central indicators in order to identify qualitative features of actual design practices in organizations. This thesis has defined platform strategies as representative design outcomes that reflect all kinds of significant attention structure in carrying out organizational design practices (Section 2.4.5). By using our definition of 'platform' and its mechanism, it can demonstrate how all the sets of design practices in organizations differ in enacting organizational cultures by using practical empirical data sources e.g. primary interview data; flow of financial results in organizations; and product strategies in qualitative and quantitative data sources (Section 5.3). This study can therefore provide empirical evidence that the different characteristics of enacted organizational cultures in the East and the West can affect their approaches to managing design in conceptualizing design outcomes.

This research is based on an idea about human enactment that is still situated in rationality-based organizations. In consideration of the perspective of material practice-based organizational culture, all kinds of design practices can be limited within certain controlling conditions because of the nature of exploitation of organizations e.g. concerns about feasible solutions for new products to yield marginal benefits. In this sense, if it is understood such rationality-based mechanisms as seen in advance in design practices, design research on such human enactment in organizations can avoid this abstraction by providing clearer evidence that can explain about the cause and effect relationship of human enactment in organizational design practices.

In relation to these issues, this study has illustrated the different types of concerns and the features in enacting organizational cultures whilst carrying out material-based design practices. Different features of enacted organizational cultures in the East and West are likely to affect their approaches to the development of design outcomes and digital platform strategies. Hardware manufacturing domains in Eastern organizations showed 'tipping' strategies in exploitation, whereas software design domains in Western organizations were characterized as 'coring' strategies in more exploratory approaches.

The overall inference here is that understanding the mechanism of platform strategy as design outcomes (digital platform strategy) can contribute to examining how specific features of an enacted organizational culture can affect the results of design practices that are undertaken by a series of subjective human enactments. The attitudinal features of risks or uncertainties, exploitation and exploration can be specified with these explanations.

6.4.2. Digital Platform Strategy to explain Enacted Organizational Cultures in Designing

Looking at a digital platform strategy provides significant understandings of designing whilst helping to explain enacted organizational cultures in design practices for new digital products and services.

Prior cross-organizational cultural studies have provided little in-depth understanding of human enactment in such evolutionary design practices (section 6.2.4). It has only focused on attitudinal variables that appear in organizational work practices (e.g. Hofstede, 1994; Hofstede et al., 2010). Likewise, prior design studies have rarely noticed such limitations in identifying how organizational cultures affect design 'outcomes' and 'outputs' nor have they discussed how it is enacted in carrying out design practices; especially design practices for evolutionary artefacts, digital new product and service design. These studies only attempted to identify key attributes that can affect organizations' strategic attention structures – i.e. decision-making processes with a focus on generalizability in debates over similarities or differences – and this has been accomplished by replicating approaches used in prior studies': e.g. Hofstede's survey results (e.g. Song & Parry, 1997; Lee et al., 2000).

In this sense, this thesis provides key evidences of a relationship between design outcomes and organizational cultures by looking at an organization's manifestation of design practices, digital platform strategy as follows.

First, this study shows that different organizational cultures affect the designing of evolutionary artefacts in their examination of digital platform strategies run by large organizations in the East and West. Looking at the enacted organizational cultures in the selected cases, the East Asian organizational cultures have been characterized in terms of collectivism and higher power distances, but have developed their products efficiently within a type of internal platform for incremental achievement of design outcomes, so aiming to exploit their short-term oriented design outputs (Section 5.3.4). On the contrary, the Western organizations rooted in individualism and less power distance have tended to explore their opportunities and have accomplished longer-term oriented design outcomes that can regenerate their own indispensable design outputs i.e. coring digital platform strategy based on loosely-coupled, enacted organizational cultures.

Next, this study has also identified how approaches to managing design differ in examination of digital platform strategies when considering organizational attitudes in terms of heterogeneities and risks vs. uncertainties, which are underlined in the landscape of digital innovation. In the shifting design rules for digitizing products and services, the issues of the heterogeneous elements constituting digital ecosystem and platform complements cannot be neglected, being that they lead to new opportunities for an organization. That is, designing is instead associated with adaption of those

heterogeneous design elements in digital platforms with ambidexterity capabilities balancing exploration and exploitation in agile ways (see Section 1.1.2).

Furthermore, this study has revealed the different approaches to digital platform strategies. Digital platform strategies devised by East Asian organizations – 'tipping strategy' – are rooted in exploitative attitudes concerned with perceivable 'risks' in enacted organizational cultures. Here, higher demands from top management and collective interests in competitive environment lead to severe political tensions, which then produce *featuritis* design outputs (see also Section 5.3.3.3). Whereas the Western organizations' digital platform strategies follow a 'coring model' as the result of balancing exploration and exploitation and so embracing uncertainties in devising their outcomes. This leads them to hold a protagonist status in the digital ecosystem.

This study has also uncovered actual concerns about generative design practices, such as open design; co-design which represents 'designing'-in actions (Section 5.3.4.2). The issues are not only limited in cross-cultural issues, but they are also applied to generic features of enacted organizational cultures in carrying out actual design practices. Although organizational features have significantly differed in many respects from national to corporate cultures, design studies on such generative design practices have considered little about actual organizational contexts. In fact, looking at organizational cultures in the East and West, despite growing needs for interdisciplinary design practices for holistic artefacts design, complexity issues of enacted organizational cultures and of digitalizing artefacts have been underestimated. These elements can significantly constrain generative design practices including different features of hierarchical organization structures in the East and West; enacted domain definitions and heterogeneity issues in complex design disciplines; and complex mechanisms of enacted attention structure have all played a role in carrying out such design practices, otherwise rarely discussed in previous design studies.

In conclusion, it is important to shift our views on design practices and organizational context design into a more sociotechnical direction in order to embrace a continuingly evolving design trajectory. Enacted organizational cultures, evolutionary artefacts (product, services and organization structure) and underlying complexities in undertaking design practices should be reconsidered in design research in order to clarify the genuine concept of 'designing'. In this sense, consideration of a digital platform strategy in this study will provide significant contributions to future research design.

6.5. Chapter Summary

This chapter has discussed contextual issues in explaining the concept of designing; enacted organizational cultures from cross-cultural perspectives of the East and West; actual influences of the enacted organizational features in managing designs for evolutionary artefacts, new digital products and services. It reaches the point where designing in-actions can be conceived differently in terms of differently enacted organizational cultures related to managing risks or uncertainties in enacted organizational cultures.

This study also provides a key understanding of how approaches to managing design can differ when considering enacted elements of organizational culture in design practices for digitalizing artefacts, achieved by visiting enacted domain definitions (hardware and software) so paying attention to structures in actual organization structures. It shows how such enacted organizational cultures react differently to risk or uncertainty in undertaking exploitation and exploration in creating their own evolutionary design outcomes in a digital platform strategy.

Finally, considerations about digital platform strategy in enacted organizational cultures lead to critical discussions to analyse the concepts of organizational culture, embracing evolutionary artefacts design and the organizational contexts. It illustrates that design and organizational studies should consider more about organizational culture as a root of metaphor to account for human enactment underlined in evolutionary artefact design practices.

Based on the above issues, findings and conclusions, the next chapter will suggest a new theory based on a matrix of enacted organizational cultures in design practices and design management models.

7. The Matrix of Organizational Cultures in Design Practices, and the Design Management Models

7.0 Introduction

Examining different approaches to managing design in large Eastern and Western organizational cultures offers a new understanding of complicated organizational features that appear in increasingly complicated design practices in terms of new digital products and services. It illustrates actual organizations' concerns with regard to carrying out such generative design practices as those entailing holism in order to create those evolutionary artefacts - i.e. digitalizing product and service design.

In this sense, this thesis suggests a theory related to enacted organizational cultures: central concerns of organizations in managing design situated in the unprecedented landscape of digital innovation are closely associated with distinctive organizational attitudes towards 'uncertainty' or 'risk'. This is related to a tacit understanding of these aspects which is accumulated through organizational experience in creating new artefacts. The inherent organizational attitudes to uncertainty and risk are reflected as enacted organizational cultures in multiple respects, whilst undertaking design practices to introduce increasingly complicated new digitalizing artefacts.

As the new theory suggests, this chapter presents a matrix of enacted organizational cultures in terms of design practices; and this is to be developed as new design management models. By doing so, that will provide new understandings of design management studies in accordance of evolution of design practices. The suggesting categorization in the matrix and the key design management models is not only presentation about relationships between organizational cultures and design practices in digitalization; but it can also help readers understand why design management studies have been in challenges to be applied to practices and academic research as a promising discipline (see Section 1.1.4). The suggesting dimensions will be useful readers to broaden their perspectives on meaning of design, management and organization by clarifying an evolution process of design practices and organization. The following areas are encapsulated in this study:

- **Organizational approaches to managing design in organizations (Section 7.1)**
- **Absorptive capacity for designing in organizations (Section 7.2)**
- **Development of a matrix of enacted organizational cultures for designing (Section 7.3)**
- **Development of new design management models (Section 7.4)**

7.1. Organizational Approaches to Managing Design in Organizations

7.1.1. Organizational Approaches to Holistic Design

Organizational approaches to managing design practices related to the design of new digital artefacts representing holistic design are summarized in how an organization views the uncertainty that surrounds design practices, which can turn out to be a viable opportunity in the process of creating new artefacts: i.e. new digital product and service designs. In order to distinguish such different organizational approaches to the managing of uncertainty or risk, the classes of organizational approaches to managing design are to be illustrated.

As addressed in Section 2.5.1, two concepts – uncertainty and risk – are distinguished in order to explain material practices: risk being related to measurability, objectivity and the insurability of probabilities; uncertainty associated with immeasurability, subjectivity and uninsurability (see Langlois & Cosgel, 1993: p. 457).

On the other hand, understanding of the notion of 'experience' is also in line with this as it is related to the boundary between recognition and perception, where the meeting point, 'experience', is accomplished (see Section 2.2.1). A level of organizational capability in design practices determines a level of control within an organization which comes to form part of an organizational culture (see Sections 2.4.2 and 2.5.2.2). Since uncertainty is an aspect that has not previously been measured and predicted, the organizational capacity to deal with uncertainty could hardly be accumulated by an actor (organization) that had never 'recognized'(experienced) and learned from a particular event before; whereas risks are measurable, and somehow objective, in that they can be predicted, referring to a thing that can be explotitatively managed so as to construct a particular artefact based on exploitatively accumulated learning capacity (i.e. the experience).

As addressed in Section 2.4.2.2, the relationship between hierarchy, uncertainty and machines (product) in bureaucratic contexts is discussed in the traditional literature: i.e. machine bureaucracy. In a machine bureaucratic type of organization, 'control' is in effect, and this is reflected in organizational attempts to eliminate all possible uncertainty. By doing so, the organization can produce its output – product – smoothly without disruption in terms of existing ways of operating: planning in an organization is an action to reduce uncertainty and control and is referred to as a form of power (Mintzberg, 1983: p.167).

Returning to the issue of new product and service development, it is inferred that, although all kinds of uncertainty can be converted into opportunity with regard to new products and services (see Section 2.5.1.1), if it were not adequately perceived by an organization in terms of creating its explicit

property, neither an opportunity nor an uncertainty could be created within such an organization. Organizations give more consideration to explict benefits for exploitation with their new artefacts. Creating holistic digitalizing artefacts (e.g. digital platforms) can therefore be hindered by these conventional approaches (see Section 5.3).

7.1.2. From Coercive Approaches to Discursive Approaches

Based on the above understanding, four classes of approach to managing design are presented. Although these are characterized as a continuum, the terms are labelled specifically in order to guide a relationship between organizational cultures and design practices in the digital realm: **coercive & enabling controlling; interactive and discursive ways of managing design:**

Firstly, the **controlling approach** is divided into two features in organizations in terms of managing material practices: **coercive** and **enabling controlling**. Design management situated in either one of the two terms is featured within the extent of formalized activities inside organizations. This is the case in terms of managing complex material and systems: goods or services for an organization's improved performance in the market using a given technology (Section 2.4.2.1). The distinction of organizational attitudes as they are reflected in an organizational culture results from an interdependent mechanism that an organization makes use of in managing 'risk' in creating complex products and services. In the design process associated with creating a single hierarchical product design, the more complex the product, the more tightly-coupled is the control necessary within the organization for smooth production. For instance, hardware domains are very concerned with the explicit benefits resulting from their products and services because they need to minimize all explictly perceivable risks (see Sections 5.2.2.1 and 5.3.3.1). The ways of controlling the approach to their property in terms of managing design is accompanied by a tightly- coupled organization structure (see Sections 5.2.2.2 and 5.3.3.2). Such ways are conceptualized and shared as an organizational culture through design practices.

In the formation of an organizational culture in carrying out design practices, **coercive control** refers an organizational approach that features a one-way bureaucratic style in managing design (see Section 2.5.1.3). The emphasis of this apporach is on keeping up with standardized rules and roles in a design process under strong supervision and governence: prioritizing identification and minimizing deviations to reduce risk within a fomulated procedure, so that the roles of superiors and surbodinates are clear; superiors are the ones who offer approval, and surbordinates are the others who follow the authorized rules and manuals. The characteristics of East Asian organizational cultures – higher power distances and collectivism – are explicilty optimized in the early phase of building their domains for the efficient development of their organizations, and of hardware products, along with

improving manufacturing capabilities for developing a national economy (see Sections 5.2.1.1.1.and 5.3.2.1). For this reason it is characterized as a reductivist approach in terms of making an object, rather than creation.

Enabling controlling can allow design professionals to undertake their design practices in their own way, because the complexity increases in the products they design. So, an understanding of contextual information and knowledge become important for both superiors and surbordinates amongst design professionals. This can therefore be described as a two–way communication bureaucratic approach, which is still situated in controlling organizational vocabularies, as Adler and Borys (1996) noted (see also Section 2.5.1.3). Consequently, the context is still addressed within an organization, within which a new product and service is developed in a certain formalized way in terms of organizational governance. It still has limitations when it has to consider heterogeneous elements emerging from situations it has not experienced before.

Thus, it is still concerned with exploitation in creating a new product: it needs to consider measurable risks and explicit benefits in terms of its properties.e.g. revenue, operating profit and growth rate. This can be seen in selected cases: although East Asian organizations have apparently grown up very rapidly in terms of their attention to profts and revenues with the diversification of their product lines, their ways of dealing with complicated and diversified product lines (i.e. dealing with a variety of product designs) has been developed within a limited boundary of controlling organizational language, in order to keep up with constantly increasing complications due to diversified product lines. So their initial strategy for creating a new product or service: i.e. their platform strategy, has been characterized as a 'tipping' strategy, resulting in *featuritis* product design (see Section 5.3.3.3). In large organizations, the collectivism and higher power distances that exist are still in effect leading to the formation of their own organizational culture. In the new digital product development process, multiple heterogeneous elements are overwhemed. This managing style can still hinder the exploration of uncertain opportunities as the organization is still concerned with explicitly perceivable controlling factors in producing existing products. This is because the uncertainty that arises from heterogeneous elements has never been experienced or learned before. Collectivism and higher power distance in the organizational structure act as an inertia that inhibits the absorption of new things in synthesizing and creating new artefacts (see Section 6.2.3).

The **interactive approach** is distinguished from the previous two terms as it avoids such one-way approaches to managing design. The concept can be found in a trajectory of artificiality towards a discursive style of managing design, introduced by Krippendorff (2011) (see Section 2.5.3.3; Krippendorff, 2011, p.412). The boundary of the 'interactive approach' is distinguished from the previously considered controlling style with regard to managing design. The major criterion that distinguishes between them is the reason for substantial actions in managing design: design practice in

controlling is aimed at producing a good or service within a sense of commercialization/ industrialization, whereas the aim of **interactive design** is to build an artefact-embracing human consciousness in order to construct interactive artefacts (Suchman, 1994; Rheinfrank et al., 1992). The interactive artefacts include computers, simulators and control devices (Krippendorff, 2011).

However, this type of approach to design is still concerned with building exploitative properties such as appearances and functions in the development of new digitalized products and services. Such approaches are not completely divorced from organizational considerations about their explicit benefits. This is because creating these artefacts still involves a process of miniaturizing and digitalizing electronic products that can 'interact' with users. In the process, it can be seen that such an exploitation of existing organizational capabilities to deal with these complex physical artefacts, are ones which other rivals can also address.

Apple's design management style and its products and services are included in this case. Their products are ones that foster human interaction involving its own devices and software systems; yet its approach to managing design still aims to achieve explicit benefits because it is not fully devoted to developing 'radically new' products that significantly impact on the market and on technology (see Figure 2.1). However, its achievement has been the creation of its own long-term oriented business model, using its own service platform and offering indispensable product lines, that consumers are necessarily attracted to in order to use the service platform (see Section 5.3.3.3.1; also Pisano, 2015).

The Western cultural domains that are characterized by individualism and smaller power distances, can foster their long-term oriented design strategies because the leader's strong vision and plan can more easily be shared with design professionals, compared to the East, where there is little concern about complex political tensions across the organizational structure (Section 6.2.3). The domain definition itself is neither derived from a certain boundary of national politics, nor economic interest (see Section 5.3.3.1.1). But Apple was started with a few individual professionals' exploitative interest in computing (see also Section 6.2.3). Within a competitive digital landscape, this type of organization can, to some extent, face uncertainties in dealing with its purposeful actions regarding its long-term oriented business model. Due to the establishment of such a model and its outcome – a digital platform – there is still room to explore uncertainties in relatively less-hierarchical and decentralized organizational structures. This is also because individual professional members' feelings and their professionalism are, to a certain extent, detached from the organization's collective and informal interests, due to its individualism and lesser power distance at the group level. The organization can therefore exploit its long-term oriented plans that come from the leader's vision with regard to such interactive artefacts (see Section 5.2.2.2; and also note Section 6.2.4).

Lastly, **'discourse'** refers to symbolic and metaphoric approaches to design, as this has been absorbed into an organization as part of the process of creating evolutionary artefacts (see Sections 2.2.3; 5.3.4;

and Section 6.2.4). This rather emphasizes human enactment in carrying out design practices by considering both users and designers, beyond any consideration of its purposeful actions for explicit benefits. For this reason, this is distinguished from the concepts, 'controlling' and 'interactive', as symbolic and metaphoric actions.

In this condition, the boundary between organizations, design professionals and users is blurred, as all these participants' design practices are based on daily design inquiries, so that this can achieve '*generativity'* in creating new artefacts. Digital technology and the landscape are useful in terms of fostering such practices, as it can allow an open environment in less hierarchical structural conditions between external and internal organizations (see Section 2.5.3.3; also Yoo et al., 2012). In this sense, this concept of managing design style and design practices is close to the concept of metaphoric/symbolic actions that are absorbed into the organizational culture (see Section 5.3.4 and Section 6.2.4). Since the boundary between organizations and users is diluted, so the meaning of all 'human practices' are recreated and regenerated as a root metaphor with artefacts, beyond the consideration of the hierarchical complexity of materials in organizations and products (note Smircich, 1983; Pondy & Mitroff, 1979).

In creating digitalizing artefacts, the uncertainty that can be caused in the convergence of heterogeneous elements is acceptable. This leads to the capture of another opportunity beyond explicit considerations of risk in implementing such heterogeneous elements. For this reason, organizational cultures are laid neither in certain explicit power structures nor in the informal interests of particular

	Organizational approaches to managing design			
	Coercive controlling	Enabling controlling	Interactive	Discourse
A degree of complexity in design practices	• Moderately complex in single hierarchical product architecture		• Significantly complex in multiple layers of product architectures	
Organizational inquiries	• Managing moderate risks based on what has been experienced before: managing homogeneous elements		• Considering uncertainty as a problematic element: heterogeneous elements inferred as opportunities to be captured	
Fitting organizational cultures	• Collectivism and higher power distances for an organization's efficiency in a steward-like organizational context		• Univerisalism embracing power and groups beyond an organizational sense: balance between individaulism and moderate power distance	

Table 7.1 Organizational approaches to managing design

groups as is often found in strongly collectivistic and higher power distance characterized organizations, i.e. universalism (see Section 4.2.3).

To conclude, looking back at the cross-cultural perspectives that exist in material practices, the continuum process necessary to reach a disourse level is shown as an evolutionary process rather than a revolutionary one. This is because the above discussions cannot be ignored with regard to the issues of complex material practices that lie in institutional and technical constraints, as related to the level of 'experience' that an organization should go through within such frames. For this reason, it is important to understand the different roots of material systems and the constraints that affect an enacted organizational culture in terms of design practices. Looking at East and West, domain definitions interplay with a country's industrial legacy and development progress, and it is followed by an inherent organizational structure and an enduring attention towards the structure of a certain design practice. An inherent value in terms of material practices, which are associated with *a priori* experience, can influence an organization to perceive uncertainty differently;and it can affect organizational approaches to managing design.

7.2. Absorptive Capacity on Designing in Organizations

7.2.1. Ambidexterity in Terms of achieving 'Designing' Capacity

An organization's design capacity is not only related to its explicit capacity to exploit its technical capabilities, leading to concerns about perceivable costs and benefits in such a measurement mechanism. It is also associated with its tacitly accumulated understanding that can assimilate multiple heterogeneous elements – containing uncertainties – into one artefact as a whole (see also Section 2.5.2.2 on the concept of absorptive capacity, and Sections 5.2.1.2; 5.2.1.3 and 5.2.1.4 about the elements that can affect organizational design capacity).

As noted in Section 2.5.2.2, this study reveals that such tacit capacity is however necessarily constrained by explicit organizational concerns regarding exploitation relating to perceivable controlling factors and to explicit and implicit power structures in enacted organizational cultures.

Within these contexts, it has been revealed that national cultures placed in the complex material and industrial mechanism act as a source of fundamental institutional inertia (see Section.5.1.1; 5.2.2.3; and 5.3.2.1.) and it is not much easier to accumulate such tacit organizational capacity in terms of such complexity of material mechanisms in design practices: organizations should concern themselves with such all-constraining elements that are interlinked with such institutional and explicit controlling factors that exist in creating new evolutionary artefacts as a whole.

In this context, the findings of this study help us consider such tacit design capacity as another type of absorptive capacity for design, as part of enacted organizational cultures (see also Section 2.5.2.2 & Section 5.2.2). This thesis classes the tacit capacities as being part of the holistic design approaches.

7.2.2. From Visceral to Reflexive Design

Four classes of absorptive design capacities are to be considered: **visceral; behavioural; reflective; and reflexive design capacity**, all of which exist on a continuum. These are labelled to reflect an understanding of four modes of learning associated with product creation processes requiring different level of learning to create new complex products and services; and to understand the following organizational structures in processing information for new product and service design practices (see Section 2.5.2.2.).

The labelling of the words is based on the work of noted psychologist, Donald Norman: *The Design of Everyday Things* (2013) and *Emotional Design* (2005). This study interprets and adapts his major concepts relating to the dimensions that explain an individual human's cognitive and emotional processing and that individual's design practices. However, in this study, the concepts are employed to explain an organization's absorptive capacity for 'designing', with an understanding of the enacted organizational culture reflected in product creation. The classes are accomplished by combining organizational learning capacity for creating new products and services, and ways of organizational learning in order to create new and complex products and services including *know-how; know-why; know-what* [20] (see Section 2.5.2.2.; also note Sanchez, 1996; Sanchez & Mahoney, 1996; Cohen & Levinthal, 1990). These include:

Visceral design capacity which is accumulated based on basic learnt knowledge – '***know-how'*** – that someone or some organization has previously addressed. So this is the basic organizational capacity to develop a new product. However, since organizations rarely develop a brand new product that other competitors cannot easily imitate, it focuses on reducing and minimizing the expected risks and considers increases in explicit benefits resulting from the new product in order to minimize responses from its surrounding environment (market and technology). This is illustrated in an early phase of

[20] Classification of the three forms of knowledge was introduced by Sanchez (1996) in order to explain the management of new technology and organizational capability for creating new products based on modularity theory (see also Sanchez & Manhoney, 1996). The details are as follows:

- **Know-how knowledge** requires a level of practical understanding of how current products work, and so organizational capability derived from such knowledge is limited to producing and refining product design that has been addressed before.
- **Know-why knowledge** is accomplished by developing a theoretical understanding of reasons why a product is designed and how it works. Consequently, the firm attaining this knowledge can not only adapt current designs, but also develop defined new products.
- **Know-what** is situated at the highest level of understanding of product design. This requires strategic understanding that compromises both know-why and know-how knowledge; and so it is feasible for firms to imagine and define new kinds of product and services.

domain development in the selected East Asian organizations that is in alignment with national economic growth. These organizations collect incremental human power in order to attain existing knowledge in terms of how first to make a product for rapid incremental growth (see Section 5.3.3.1.). In this stage, new product development and design practices are focused on add-on physical features and making tangible property only, so that existing consumers are attracted to due to its looks and features. Through incremental learning in terms of component and architecture levels, a new product is created by considering the separation of each relevant discipline. It is a physically refined product design: e.g. engineering design for manufacturing and product design for aesthetics. The understanding associated with creating a new product is limited to how the existing product is to be made and handled at the practical level within a given understanding of the product.

However, the capacity can still be achieved by subsequent attempts to follow the same manner when it comes to designing a product. Like an individual's learning process, this is not said to be a tacitly absorbed capacity, because this design capacity has been accumulated with little understanding of how the product has been accomplished. Samsung and Sony used this method to obtain new knowledge with regard to creating new products in their early phase of business, because of a lack of supportive resources after the national instablity following World War II and the Korean War (see Section 5.3.3.1.1). For them, product strategy aims to exploit product property itself rather than deal with considerations based on a long-term oriented platform strategy. For this reason, major concerns have focused on increasing explicit benefits and increasing efficiency with regard to new products of particular interest for the internal organization. Political tensions within the internal organizations and specialization between design professional groups can therefore emerge in order to capture each group's interest (see Sections 4.2.3; 5.3.3.2 and 5.3.3.3).

Design practices are featured in a limited range of disciplines; and so rules and roles of design units within an organization's structure can adhere to the organization's initial domain structure in a reductive manner (see Section 5.2.2.) because each unit should focus on attaining its own capacity in order to deal with the section's complexity of product manufacture and of design: engineering sections learning new knowledge about product function and logics; design sections considering how to improve physical product features to capture consumer's emotions with shape, materials and colours, etc. (Norman, 2013; Norman, 2005). However, for organizations, this basic design capacity is important because this is the first step to understanding how a product functions and can possibly be designed.

Behavioural design capacity is achieved in terms of ***'know-how'*** or '***know-why'*** knowledge by understanding how a new product or service is used by the consumer (Norman, 2013; Norman, 2005). To do so, attaining more significant knowledge is vital in order to design a new product that performs and functions well from the start. This is based on a tacit understanding of human experience and an

anticipation of a person's willed action that interacts with a well-functioning product. A theoretical understanding of 'existing product design principles' (know-why) is important in order to adapt and refine the existing meaning of the product (or service). At a technical level, organizational capacity is extended to an understanding of the intra-interaction between components and product architecture, and from the inter-interaction between components in terms of a reductive approach (Section 2.3.3).

At this stage, organizational design capacity is addressed with regard to how a 'new' product is defined, exploring the mechanism of the market and of the technology involved because the organization has learned and tacitly accumulated theoretical knowledge on existing product design principles.

However, behavioural design capacity still addresses the existing meaning of a product because it should be concerned with its best-performed product function, based on an understanding of usability. So a new product is developed within a boundary of existing physical product concepts that designers have observed and experienced in evaluating the user's mental mode (Norman, 2005): interactive product design can be considered in this capacity, in that it communicates mutually with users to determine its best function and usability within an existing meaning in terms of the product and system (see Section 2.5.1.3; see also Adler & Winograd, 1992; Rheinfrank et al., 1992; Adler & Borys, 1996).

On the other hand, this infers that behavioural design capacity is still not enough to create a new human experience, as it is developed within relevant experiences that design professionals and consumers have experienced before. So this still has limitations when it comes to assimilating all heterogeneous 'design' elements into one artefact that evolves and gives forth new meaning by itself, because it is still addressed in terms of what has been addressed previously within the organization. For that reason, the design practices in organizations are still concerned with the separation of relevant design units and disciplines in a reductive manner in terms of the assimilation of organizational capacity; and so the initial domain definition of an organization is not unimportant when it comes to discussing this capacity. Consideration of an organization at this level can still be affected by explicit benefits that occur in the near future: concerns about shorter-term strategy. Looking at selected cases (Section 5.3) this was illustrated in the case of mature large East Asian organizations (Sony and Samsung) and later Apple in the West: Although the East Asian organizations have accumulated significant technological knowledge that can be used to refine and build new product categories, it has still been shown to be difficult to regenerate new products and services as they show lack of the ability to assimilate heterogeneous elements (e.g. software and hardware) into one artefact as a whole, as part of a longer-term oriented strategy: i.e. a digital platform strategy; whereas later Apple products and software have still addressed existing products

and services with little change in terms of their technological properties while still earning maximized profits (see Section 5.3.3.3).

Reflective design capacity is closely associated with metaphoric/symbolic organizational capacity, leading to an organizational culture associated with holistic design practices (see Sections 5.2.1.3 and 5.2.1.4). This covers heterogeneity and creates new meaning by reflecting an organization's experience, moving beyond instrumental and purposeful material practices, because it constructs an artefact as a whole by viewing 'design' as a symbolic action tacitly absorbed into an organization as an entity. For this reason, this capacity can understand rooted uncertainty, and can transfer this into new opportunities in terms of new products, rather than being concerned about the explicit risks and benefits resulting from them.

However, in order to achieve this level, technical and practical knowledge – i.e. know-how and know-why knowledge – is essential to accomplish the best functioning product, as well as developing the aesthetics that are attractive to customers (users). With such a capacity, the product can appeal fully to people's experience that are shared and evoked through prior consciousness. Thus, the design capacity in an organization is referred to as a tacit understanding of human experience that has been little addressed in existing design approaches. For that reason, the actual attention structure (i.e. decision-making) in the organization is consciously approached by taking a longer time, because attention to this aspect reflects all events that the design actors (design professionals and participants involved in design practices) and users have experienced before. By doing so it can satisfy subsequently occurring human emotions and experience in using the product (see also Norman, 2013).

This is therefore absorbed into an organization as reflective action including ***'know-what'*** knowledge: achieving a significant level of knowledge from the physical level of the product at a practical level; to a strategic and imaginary capability in terms of defining a new meaning of a product. An organization accumulating this capacity can consider their strategic approaches at a holistic platform level, for it to become an evolutionary artefact. So in the first part of the design process, the design participants place less emphasis on explicitly considering proprietary or marginal issues addressed by them because the participants look at new opportunities from a holistic approach involving long-term perspectives.

In terms of organizational structure, this is characterized by an ambidexterity between an agency-like model and a steward-model, as the capacity is required to remove all implicit conflicts coming from explicit considerations of short-term benefit and of political tensions between professional members operating in their informal power structure at a behavioural and attitudinal level (see Sections 5.2.2.2.2; 5.3.3.2; see also Sundaramurthy & Lewis, 2003; Davis et al., 1997).

This can be found in the Western-based organizations, Google and Apple, as in the early stage led by Steve Jobs (see Section 5.3.3.1). Based on previously accumulated knowledge these organizations had already considered how to develop new digitalizing products (computing systems and products); and so their domains were already established by their leaders' visions with regard to what constituted best computing. So their design approaches to products or services had been already been considered at the digital platform strategy level, rather than in terms of the separation of single products and services to be added on. So their products and services contributed in such a way that all multiple external participants are involved in their incomplete design process, by providing their digital platform offerings that head towards completed ones constructed by all participants (e.g. Google Android, iTunes service platform, Mac system and essential hardware product lines etc.) (see Section 5.3.3.3).

Thus, in the development of their subsequent new products and services, their attention has been less in terms of making better performing products and providing better services that are necessarily concerned with explicit spending and the new allocation of resources; but have been more closely related to how to offer another experience and opportunity for users, and how to expand their indispensable offerings from which users and design participants can recreate meaning.

However, from these cases, it can be seen that new products and services are still defined and offered within one's own particular domain definition. Because of this, the feasibility of new products and service designs is still underlined when creating a new product or service. In addition, a slower response to the market due to the longer and deeper consciousness of those organizations while operating in a competitive market place infers that this capacity does not totally fulfil the condition of a purely metaphoric/symbolic type of organizational culture with regard to their design practices.

Finally, this study proposes the new term, **reflexive design capacity**. This capacity is distinguished from the term, 'reflective' in that it embraces not only explicit considerations of design practices, but is also regarded as the higher level of reflective organizational capacity in that it approaches multiple levels of knowledge in terms of design practices. Consequently, a discussion of this capacity allows us to demonstrate the existence of metaphoric concepts of organizational cultures for generative design practices (i.e. designing), with regard to which all kinds of human interaction and consciousness are intrinsically discussed in the form of symbolic and metaphoric language (Sections 5.2.1.3 and 5.2.1.4).

To begin with, the introduction of the term 'reflexive' has been addressed in social science and organization studies. In organization studies, the discussion started with the need to consider epistemological stances of particular areas of organization study – e.g. feminist perspectives. This movement called for a return to philosophy, because diverse and overwhelming knowledge claims and knowledge producers' and recipients' experiences emerged at that time: for instance, emergent

areas in organization studies such as feminist perspectives were viewed as a type of revisiting or revising the traditional model of positivist science (Alvesson & Sköldberg, 2000).

In relation to this, the subsequent questions with regard to this human-compounded organization study – such as human enactment at the organizational level – have started to discuss, for instance, the lack of understanding of general problems with regard to overall human issues in those knowledge claims. In this sense, 'doing knowledge' and the 'activity of reflecting' are highlighted. In these circumstances, the term 'reflexivity' is suggested as a means of assessing the relationship between 'knowledge' and 'the ways of doing knowledge' (Calas & Smircich, 1992, p.240).

Accordingly, social science study takes the term 'reflexivity' and defines it as a specific version of reflection on several levels of processing in the production of knowledge; and is not only limited to a simple interpretation of a relationship between reality – what we have experienced and the result of that experience – and the outcomes of inquiry associated with that experience. Attention is therefore paid to the significance of the awareness of contextual understanding with regard to all different kinds of knowledge territories in order to weave them into a knowledge outcome (Alvesson & Sköldberg, 2000).

To apply the term to design practice and capacity in organizations, the reflexive capacity with regard to knowledge production and the reflection on experiences leading to a knowledge outcome can be referred to as the 'interpretation of interrelation': the knowledge outcome is the thing that is constructed and multiply interpreted, based on earlier understanding and multi-level reflection: *multiple levels of reflection with regard to one another*. In discussion of this capacity, knowledge as part of a producer's exploratory capacity is stressed, such as intuition, judgement, and the ability to see something happen; and how those are explicitly or implicitly addressed. In addition, it underlines that the action of interpretation in reflexivity neither is self-dependent nor adheres to a particular way of interpretation (Alvesson & Sköldberg, 2000, p.248).

In this context, the notion of reflexivity in terms of knowledge production – the iteration of knowledge interpretation with multiple levels of reflection – corresponds with the concept of generative design practices leading to 'designing' in action. In design practices, the organizational capacity related to design evokes, as a root metaphor, an organizational culture, moving beyond the consideration of explicit and exploitative material practices (note Section 6.2.4).

The new products and services that those organizations create are design outcomes that new human experience constantly accesses in order to generate and recreate new meaning in terms of a product; and the organizational languages involved in creating new products and services are only marginally concerned with the explicit benefits or the spending that puts organizations in control of them with a certain hierarchical artefact structure. Therefore, organizational cultures are characterized by

universalism, moving far away from particular concerns about political tensions within a group.

Level of Design Capacity	Details	
	knowledge for design practices	Roles and Rules of Design professions
Reflexive	• Multilevel of knowledge reflecting iterative process of interpretation of 'human' • Based know-what level knowledge	• Organization/community/a group/I as a root metaphor: design practices as a 'symbolic' metaphor beyond considerations of devising purposeful material
Reflective		
Behavioural	• Know-how/know-why knowledge for making a particular object: certainty focused for exploitation	• Design profession addressed in separation of design tasks for accomplishing each reductive asset
Visceral		

Table 7.2 Level of design capacity

7.3. Development of a Matrix of Enacted Organizational Cultures for Designing

Design management for design and organizational cultures

This section aims to present the most useful ways to illustrate enacted organizational cultures in design practices. This is entitled "**The Matrix of Enacted Organizational Cultures in Design Practices".** This matrix is based on the outcomes of this research, and will provide a deeper understanding of the dimensions of the design-innovation typology exhibited in Section 2.5.3.3 (Figure 2.5).

It characterizes four types of enacted organizational cultures in design practices: **(1) assembly; (2) crafting; (3) fabricating; (4) designing (Figure 7.1),** along the two dimensions that have been identified: **organizational approaches to managing design** (Section 7.1) and **organizational design capacity** (Section 7.2)**.** The quadrants are featured on a continuum, but elements in each dimension can help readers understand the evolutionary process needed to achieve holistic design, designing. It can also offer a better understanding of how 'design practices' have been undertaken differently in large organizational cultures in the East and in the West.

As discussed earlier in Chapter 3, the dimensions and matrix are presented as theory suggestion based on this research finding in order to generate a new hypothesis for future researches, in accordance

with an abductive reasoning approach (also see Section 3.1.3; 3.1.4); so that since it is neither aimed to saturate a theory; nor test existing theories empirical generalization on the matrix will not be discussed in this section. The validity issues will be further discussed in Chapter 8 (Section. 8.3).

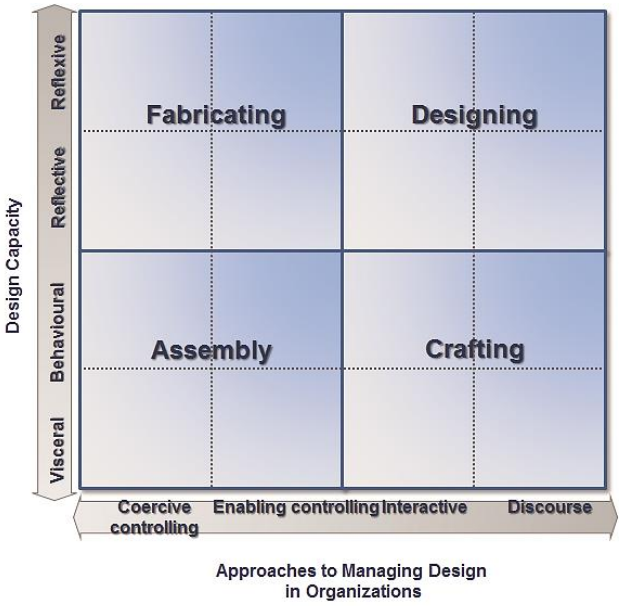


Figure 7.1 The matrix of enacted organizational cultures in design practices

7.3.1. Classification of Enacted Organizational Cultures in Design Practices

The details of each quadrant are presented as follows:

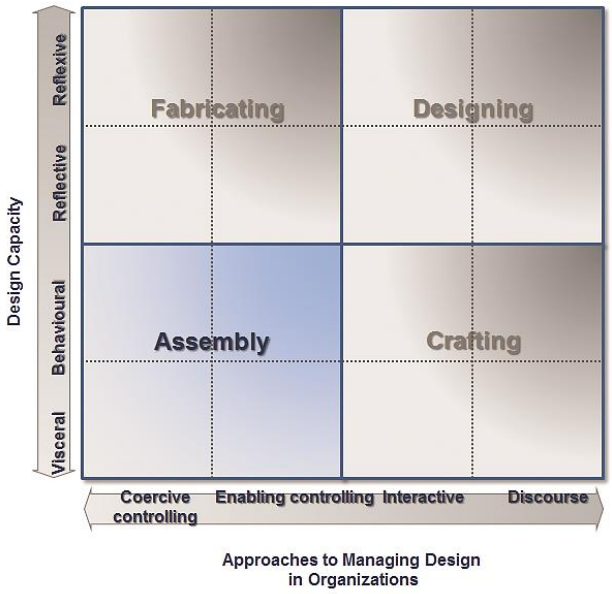


Figure 7.2 Assembly organizational cultures

Assembly

The term **'assembly'** refers to an organizational culture that is situated in controlling types of managing design, and which utilizes practical design capacities such those based on know-how or know-why. This is led by practical design projects with a lack of organizational capacity when it comes to assimilating heterogeneous types of disciplines, and is run by controlling organizational vocabularies. Because the use of knowledge and capacity in creating new products and services is not necessarily addressed at a higher level such as know-what, the emphasis of the organization in terms of design practices is rather on how to make a product. This was addressed in the past by reducing risks in a competitive market and technology circumstances.

This type of organizational culture has been found in the early phase of the development of industrialized countries such as in the early years of growth of South Korea and Japan in the post war eras (the Korean War and World War II, respectively). They focused on improving manufacturing skills and know-how through the use of large scale investment utilizing low labour costs. Recently, China has pushed this type of model by investing massive amounts of capital and making use of low-cost labour, entitled the 'brute model'[21] with a focus on manufacturing sectors (see Section 5.2.1.1.1). Collectivism and higher power distances in these countries can in effect be used to facilitate keeping abreast in terms of talent for their exploitative material practices in a controlling manner (see also Cohen & Levinthal., 1990). Their understanding of design practices have however been addressed in terms of those material practices in the separation of relevant disciplines, as the practices are focused on accomplishing optimal product functions and features within their own internal platform (see Sections 2.5.5.1 and 6.1.2.2).

In more complicated conditions, such as developing new digital products and service designs, the limited understanding of design practices leads to an enhancement of the hierarchical form of organizational culture. In product creation, the vulnerable organizational capacity due to the unprecedented complexity of products and services is situated in the subsequent evaluation processes of organizational structure. It causes the formation of an informal power structure between the disciplines in carrying out design practices, as the level of organizational capability of each group is different: e.g. one group could have more significant knowledge than others when it comes to accomplishing a product function. This can however cause conflict amongst design groups due to collective specialisms (see Section 4.2.3).

[21] The label was introduced by Kao (2009) in the Harvard Business Review (March 2009). He explained that the brute force model refers to an innovative version of the law of large numbers: applying massive amounts of low-cost labour and capital to a portfolio of innovation opportunities. Developing and emerging countries such as China, India, and Brazil expect that a huge quantity of ideas generated by a substantial number of talented people can yield valuable discoveries by inputting that incremental investment (i.e. lower cost human resources for manufacturing and capital). He then stressed that China is the world centre with regard to outsourced manufacturing, and would be the exemplar case of brute force innovation.

Accordingly, for these reasons, communication between groups within an organization has to be done in precise but exploitative ways, using reductive, explanatory, rational and formal approaches (see Section 5.1.3.2 and Table 5. 2).

In this situation, product and service design are built and constructed in an assembly-like fashion with little consideration of holistic design (i.e. platform strategy): revision, modification and changing physical features of an existing product (or adding a service) are undertaken with a lack of in-depth empathy towards those materials, which is carried out by controlling organizational vocabularies. So, imitation issues can be raised, as has been addressed in Chapter 1, relating to whether or not a physical product design is similar to that of a rival in terms of its physical features.

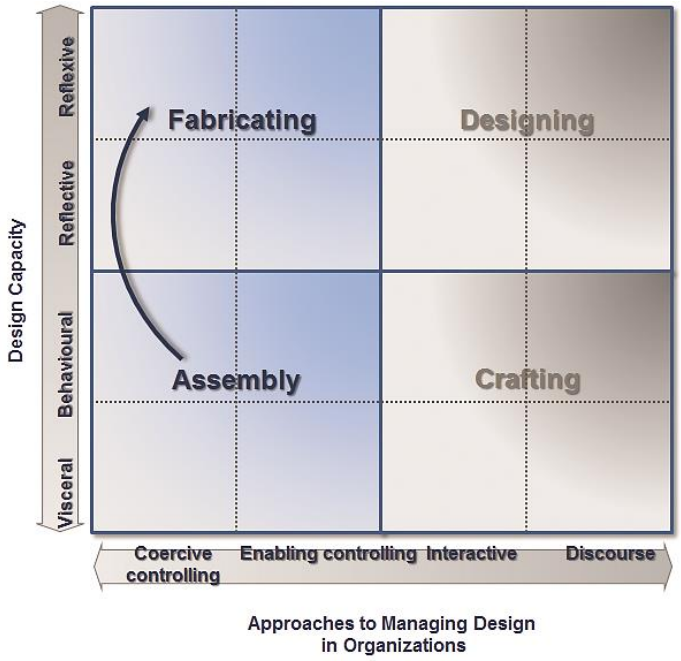


Figure 7.3 Fabricating organizational cultures

Fabricating

The term **'fabricating'** refers to a type of organizational culture optimizing **fabrication** design practices. The concept is however distinguished from 'assembly' in terms of how much heterogeneity can be embraced within the controlling boundary of one firm, as the complexity applied to organizations and product design increases (Table 7.3).

'Fabricating' in new product design can be determined by how much customers or external participants are involved in a certain framed design process (see Section 2.5.3.3). However, the notion is still addressed in building relevant or homogeneous types of product within an existing definition using limited product modularization. So, even if this type of design practice attempts to involve external design participants, it is still under the development of a firm or relevant supply chains in

terms of its platform strategy resulting in a new product (Section 2.5.5.1 and Table 2.9). It means that design participants – customers or platform complements – are still under the control of a firm or homogeneous type of organization, as concerned with their explicit benefits, while involving their design practices.

In this sense, organizational approaches to managing design are aimed at optimizing and managing know-what knowledge with regard to continuingly increasing product complexity and to embracing multiple levels of heterogeneous types of knowledge emerging from external and internal design complements. So this type of organizational culture is seemingly characterized as being open or innovative, as it promotes customers within their market place; yet this is still a limited approach in terms of the firm's explicit interests for fabricating multiple product lines in conjunction with the exploitation of their insights.

However, in digital landscapes, fabricating strategy can be confronted with challenges, and the nurtured organizational culture can be seen as significantly tightly-coupled in order to sustain their explicit benefits. The approaches to design strategy (in terms of product and platform) in the digital landscape need to be constantly tailored to their outcomes in the light of the constantly evolving digital technology and users' needs (see Section 1.1.2 and also Reeves et al., 2015). For that reason, the innovation that appears in this dimension rather features incremental innovation or brand new innovations (see Figure 2.5), rather than a radical innovation, as organizations in this dimension should keep up with what is emerging from improvements in technology and in the market, followed by another product or service produced in a boundary of existing meaning.

Amongst the selected cases, the later Samsung, Sony and Apple approaches to managing design are included in this dimension. However, there are differences found in the East and West. Samsung and Sony have carried out their businesses in a way that involves coercive control in response to competitive digital landscapes with strong collectivism and higher power distance; whereas Apple has been nurtured in terms of enabling controlling approaches based on its Westernized agency-like institution model: featuring individualism and less power distance amongst members.

In this type of organizational culture, a leader's role is therefore significant when it comes to achieving its ends, because the increasing complexity of digitalizing design outcomes requires agile decision-making, with their accumulated capacity optimizing all organizational resources: constantly crafting organization structure, tailoring organizational capability - i.e. there is a need for ambidexterity for adaptability (see Section 1.1.2). The leader's experience and insights are therefore significant when it comes to building a longer-term oriented 'plan' in these circumstance (see findings in Section 5.2.1.2).

For that reason, although exploitation capabilities are required for rapid fabrication, performances can be therefore different between organizations as the leaders' capabilities differ, and the adaptive system (organization structure and the power structure) in design practice manifests itself differently (see Sony and Samsung's cases in Figures 5.20 to5.23 in Section 5.3.3.1.2). Sony has been surpassed by Samsung in terms of revenue, although both have similarly complicated organization structures that are vertically integrated along with their hardware product and component lines (see Section 5.3.3.1.2), because Sony's 'product' strategy has been, to some extent, in confusion, due to their top management's lack of understanding of digitalization (see Sections 5.3.2.2.2 and 5.3.3.2 about territorial and leadership issues that have occurred in terms of Sony's platform strategy).

On the other hand, Apple's achievement is compelling in terms of its explicit benefits from the market (see Table 5.24 & Table 5.33) with fabricated product lines that involve little applied new technology (see Section 5.3.3.3). However, unlike those East Asian companies, in approaches to managing design, this has been achieved by the leadership and its professional group's common interest in computing, by optimizing their digital platform. This has been raised in a nurturing physical grounding that has enabled them to have a longer-term oriented vision and plan (see Section 5.3.3.1.1).

In this sense, since these organizations rely on their exploitative organizational capability and the leaders' implicit ability to encourage rapid fabrication, the organizational cultures in terms of fabrication illustrate that those organizational cultures can be associated with national cultural aspects. The differences between East and West, such as collectivism and individualism and higher and lower power distances, are explicitly evoked in managing actual design practices in terms of design participants' communication and attitudes when it comes to exchanging exploitative information and knowledge in order to address the complexity of products and services for managing their explicit benefits (see Section 5.1.3.2. and also Table 5. 2). This is because of the complexities (product and service design and organization) in fabrication that should be controlled and managed by certain power structures that consider the explicit benefits in order to reduce all the kinds of risks involved.

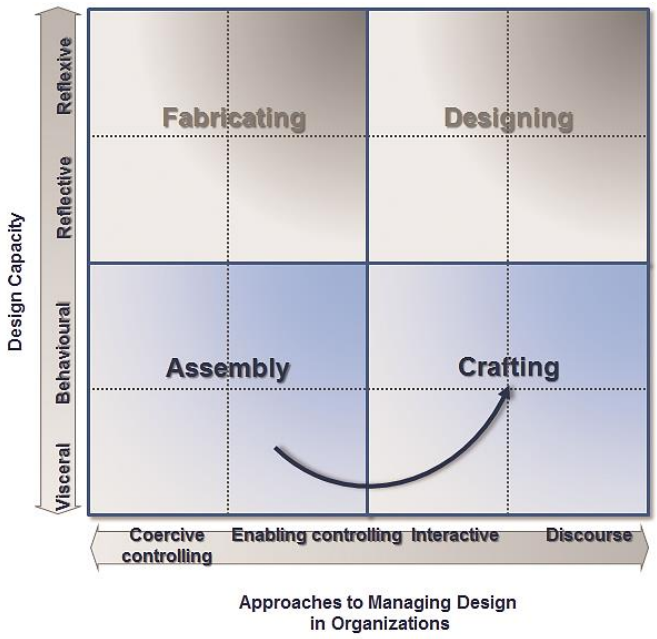


Figure 7.4 Crafting Organizational Cultures

Crafting

This study discovered that there is a 'crafting' type of organizational culture in design practices apart from large organizations' design practices. The label 'crafting' was presented in Table 2.1with regards to features of design methodology generation in terms of humans' material practices. The major emphasis of this dimension is on the scale of design practices in an organization. Crafting types of design has been observed across every aspect of human lives, historically as humans solve their daily problems with simple pre-disciplines and a skilled person's tacit understanding of materials (see Section 2.2.3 and also Broadbent, 2003). In the age of digital innovation, this material practice culture is most significant part to shape a culture of digital design practice and to form digital ecosystem. Small-medium sized start-up companies belonging to larger digital platform providers can be discussed in this category, Go-Pro(US)(also see footnote 12 in page 225), Instagram(US) and Deepmind (UK). And also there is its own platform creator from the level, such as Xiaomi(China)(also see footnote 4 in page 201). Despite the small size, roles of these organizations are significant as platform complement, regardless of its national origin. For instance, Instgram launched its service with only 13 persons in 2010 and quickly attracted over 100 million users and Facebook acquired the company for $1bn in April 2012 using a combination of stock and cash. After then although the service users even soared up by 400m users it still remains as such a crafting type of small company with even small number of employees, 400. It is because Facebook allowed remaining Instagram's own identity and management somewhat autonomous by permitting them to carry on with its own management and brand (Margolis, 2016; MarketLine, 2014). Likewise, London-based artificial intelligence start-up, Deepmind is also shown the aspect. The company was founded by a

chess game genius, and Cambridge graduate, Demis Hassabis, and now it runs with only 150 staff. However, when the company was acquired by Google for £400 million (roughly $500m) in January 2015, this has been one of the biggest European acquisition by far. Although the company had neither had any products nor found any visible revenue stream yet then, the company had been backed by notable investors such as Elon Must and eventually bought by Google, only because of its imaginative artificial intelligence development projects: solve intelligence; rather than teaching the machine to understand a language, or recognize a face etc., which has been the subject of traditional artificial intelligence researche (Rowan, 2015; The Economist, 2016). The technology that Deepmind has is thought to be valuable to the larger platform provider, as it can solve the trickiest puzzles by applying such human brain like large neural networks to development of new digital service or product. By using the technology, Google ,for instance, can train the neural networks for development of , for instance, autonomous vehicles and relevant system, rather than continuously updating 3D maps and so on for their constantly demanding services (MarketLine, 2015)

On the other hand, since they don't have the capability to assemble incrementally fragmented product parts and components (either hardware or software) by inputting massive investment, such a company's capability on risk taking is significant to achieve leading role in a digital platform. But the supportive environment for those companies can be disrupted or encouraged by a national environment (see Figure 5.14 and Section 5.3.2.1). For instance, although Instagram has been backed by large platform provider, Facebook, the service and content provider has had similar difficulties to monetize its business as Facebook was struggled (Margolis, 2016; MarketLine, 2014). Accordingly, Deepmind doesn't still have visible revenue stream either (Rowan, 2015). Because those intangible service and content business are still vulnerable to changing terms and conditions; uses of contents in the services by other rivals; and it is also vulnerable to disclosure of the contents to other third parties without any permission due to the fact of nature of digital platform (also see Section 2.5.5.2).

For some reasons, this type of organisations' design practices and design management can be stable if those are backed by larger system, such as national supports. Chinese start-up companies are shown the aspects. For instance, the tech giant, Apple has considered China as a fresh financial resource to secure its own financial benefits, and so it has been in attempt to build own digital ecosystem covering from hardware to service in China. However, it has to be confronted with Chinese barriers that are significantly backed by the governmental policy in order to protect the country's own ecosystem. Apple's service platform and contents, such as films and book services have started to be blocked in China from April 2016 (Hook, 2016). On the contrary, Chinese home grown start-up companies can take advantage of this. One of those is Xiaomi. The company was established in April 2010 with seven other co-founders by Lei Jun who studied computer science at Wuhan university. The founder has had strong passion towards making the best computer as most Western tech companies' founders did such as Apple and Google. The company quickly grew up and became the

world's fourth largest smartphone manufacturer in 2014; sold 70millon phones globally in 2015 and by far 160milion phone users use the company's products. On the other hand, although the company becomes known as the world's most valuable tech start-up company they are still criticized about copycat of Apple, intellectual property theft and so on globally. The company argues that their business model is different from Apple. It is rather focused to build an ecosystem like a 'bamboo forest'. Based on their strong hardware manufacturing 'know-how' and the domain tradition, the company has invested prospective start-up companies that attempt to get into their digital platform, rather than developing its own hardware product lines. New product development for hardware manufacturing is based on crowd-sourcing approach using user feedback. The company argues that its smartphone business is aimed to distribute vehicles to build its own platform to lead to creating another digital ecosystem (Rowan, 2016). However, despite its successful achievement the company has had to avoid accusation that its products and business model have intentionally mimicked Western companies' ones. Its operating system (MIUI) seems to be a copy of Apple's iOS; its smartphones are incredibly similar to Apple's iPhones; and the company even imitates Apple's marketing strategies such as retail shop design and the strategies etc. Accordingly, the business model that the company argued its own has a lot of similarities with that of one US firm, Amazon. It is believed that those achievements could have been done because of a notorious "copycat" culture in China: producing unashamed counterfeit goods somewhat, ironically, backed by the country's little institutional intervention (MarketLine, 2015; Rowan, 2016).

However, it is noted that this crafting type of organizational culture can be brewed by a small group of professional members who have common interests with strong passions towards their products. It shows in common from Instagram to Xiaomi. For this reason, the approaches to design practices and managing design are characterized as the interactive or discursive. Tacit and explicit knowledge can be transferred more openly in complex design practices due to the small size and commonality in the knowledge domain.

Yet the size is the significant matter to survive in larger digital platform and digital ecosystem. Most conventional platform leaders leading the larger systems are unlikely to take huge risks by reforming or reinventing their business models. New properties delivered by this crafting type of organizations are not thus easily accepted by such large 'protagonist' organizations. It shows fundamental challenges even at behavioural communication level in actual organisational settings for digital product design (see Sections 5.3.2.1 and 5.3.3.4). For that reason, achievement of innovation of these organisations can be therefore to some extend discouraged by large systems' a subject of exploitation.

Designing

Lastly, this thesis suggests **'designing'** organizational cultures. This type of organization can be said to involve approaches to managing design and whose capability is absorbed as its metaphoric/symbolic organizational cultures, beyond consideration of exploitative material practices. In such an organizational culture, design participants can involve **'generative design practices': designing'**. By doing so, the organization can present special kinds of solutions for improving everyone's daily living conditions with little exploitation. Therefore, radical innovation can be achieved in this dimension (Section 2.5.3.3).

Approaches to managing design in this type of organization are characterized as being interactive, imaginative and explorative as part of a decentralized and loosely-coupled organizational structure, by balancing between the centric/formal and acentric/informal aspects of organization structure. For this reason, such a company can craft its approaches to managing design tacitly in response to the continuingly increasing complexity of heterogeneous types of knowledge. There will be an influx of information and crafting and evolutionary artefacts holding fluid meaning in a digital landscape.

Such an enacted organizational culture is situated in a generative form that can enable participants to give birth to new meaning in terms of materials for improving human life (see Sections 5.2.1.3 and 5.2.1.4, and note Section 5.3.4). The current Google organizational culture can be included in this dimension. Unlike conventional conglomerates' approaches that exploit their properties, Google's imaginatve and pioneering projects are rarely expected by other competitors to aim at explict outcomes (see Section 5.3.3.3).

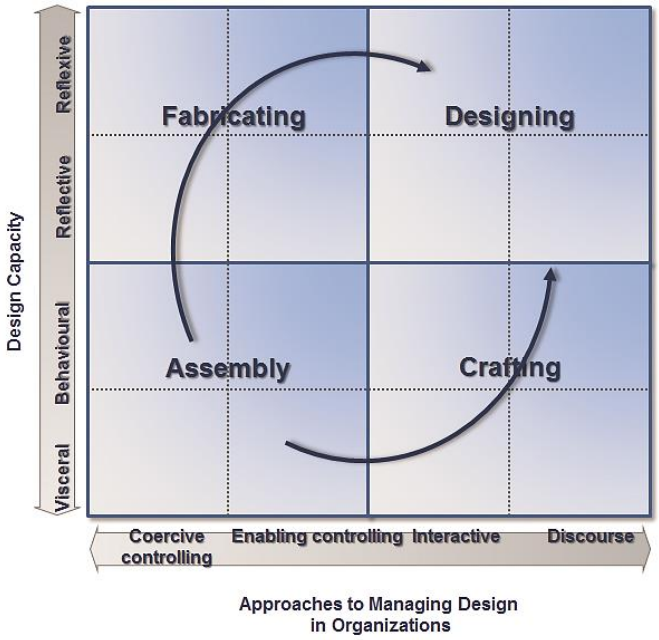


Figure 7.5 Designing organizational cultures

7.3.2. Refining Design Management Model: Design of Management and Management through Design

Based on the developed matrix of organizational cultures regarding the design practices, this thesis proposes two key models of design management in digitalization as follows (Figure 7.6): (1) Design of Management; (2) Management through Design. The concepts of the two models will provide new understandings of how the discipline, design management can be differently translated and approached depending upon a phase of the trajectory of evolution in design practices in organizations.

7.3.2.1. Design of management

The design of management model refers to a management style in which design practices are controlled and governed in exploitative ways. A nuance in the preposition, design 'of ' management implies design is belonging to management part, or 'managing activities: management' consist of part of design practices. In other words, design is part of instrumental management activities or a subsequent management action, which is more focused on making an object, goods or services.

The design practices in this model are viewed as making an 'object' to earn explicit benefits, and so design management is situated as parts of a serial process of making or producing a product or service due to its explicit benefits arising from its output. It therefore prioritizes achieving certain economic volumes for maximised marginal profits with regard to new products and services.

In this model, a new digital product and service design may be challenged by the organization's lack of understanding of uncertainty that emerges from the convergence of heterogeneous design elements. Consequently, it can be confronted with the burden of having to craft its organizational approaches to managing design in response to constantly changing needs coming from human, technology and multi-sided platform complements.

However, in explaining large organizational cultures situated in this dimension, it is needed to take into account the aspects of enacted organizational cultures such as the institutional constraints that arise from complexity, for instance, a supportive national environment (see Section 5.2.1). In understanding East Asian large organizations the achievement of rapid national economic growth is inevitably required as part of a tightly coupled collective management system . The strong leadership characteristics of these organizations are needed in order to utilize the ability to keep abreast of de-skilled manufacturing capacity and know-how based technical knowledge for the efficient deployment of hardware products in their initial growth stage. The cultural values absorbed in such large organizations – large power distance and collectivism – could foster rapid economic growth. Rational and exploitative engineering and marketing programmes are necessary to address precisely fabricated design outputs. It has been possible to raise massive numbers of talented but standardized human resources who have exploitative capacities that can be learned in a short period of time. In these circumstances, the large organizations have adopted explanatory reasoning frames in design

management: exploitative, rational, collective and explanatory reasoning skills are used to deal with unexpected and measurable risks that have likely been addressed before; so explicit formalizations have been overwhelmed in design practices in order to draw their collective and hierarchical consensus.

However, as technology has advanced, and design practices have become more complicated in order to embrace all kinds of unexpected heterogeneous elements from the internal and external environment, the large organizations are challenged when it comes to tailoring and crafting their linear approaches to the design management model.

7.3.2.2. Management through design

Management 'through' design infers managing organization and the practices comes from Design *per se* (i.e. through). Organizational problem solving processes are akin to designers' ones and it is embedded into an organization's cognitive structures: networking and processes. Design is here shared as a symbolic subject from individual members to entire organizational level shown as reflexive actions. It is seen as metaphoric actions, rather than formal and instrumental things (Section 5.2.1.3 & 5.2.1.3).

When considering enacted organizational cultures in creating evolutionary artefacts – new digital products and services – this model can be said to incorporate the metaphoric/symbolic concepts of organizational cultures, with the enacted organizational culture as a root metaphor. In this model, organizational design practices *per se* are symbolic subjects to accomplish design. Thus, the boundaries in terms of carrying out design practices are not separated, whether they are inside or outside and in text or context. So, the organization shows an ambidexterity that embraces exploitation and exploration in adapting to uncertain opportunities, and so it responds to all kinds of change in agile ways.

This can therefore be defined as the ideal design-centric model that genuinely embraces generative design practices. It can create evolutionary artefacts that can respond to on-going problematic human situations. However, in consideration of actual large organizational cultures, this model has been found in only a very few large Western-based organizations such as Google.

Achieving this model is thus said to be an evolving process, rather than a revolutionary one with certain explicit efforts. In terms of its domain, Google has developed based on its established national economic grounding and its leaders' reflective capability. The visions of the leaders and the long-established national foundations, enables the group of designers' pure interests in computing to be incorporated with the organization's vision, with little consideration of such a massive scale of material mechanism. Also, the less-hierarchical cultures in the West – individualism and smaller power distances –can foster this without concern for the informal power structures and behavioural hierarchy between professional designers. This type of organization behaves like one individual by

fostering each member's in-depth empathy with regard to human needs in carrying out 'designing' as symbolic and metaphoric practices.

For these reasons, becoming a design-centric organizational culture can be characterized as an evolving process. For instance, assembly types of organizational culture can be challenged to achieve this model with its explicit efforts, as those organizations should initially be greatly concerned with their explicit benefits in creating new artefacts. Assembly, fabricating and crafting types of organizations are hardly decoupled from those issues due to their insufficient resources and the inertia of the domains that interplay with the complexities of their design practices (see also Hannan & Freeman, 1984).

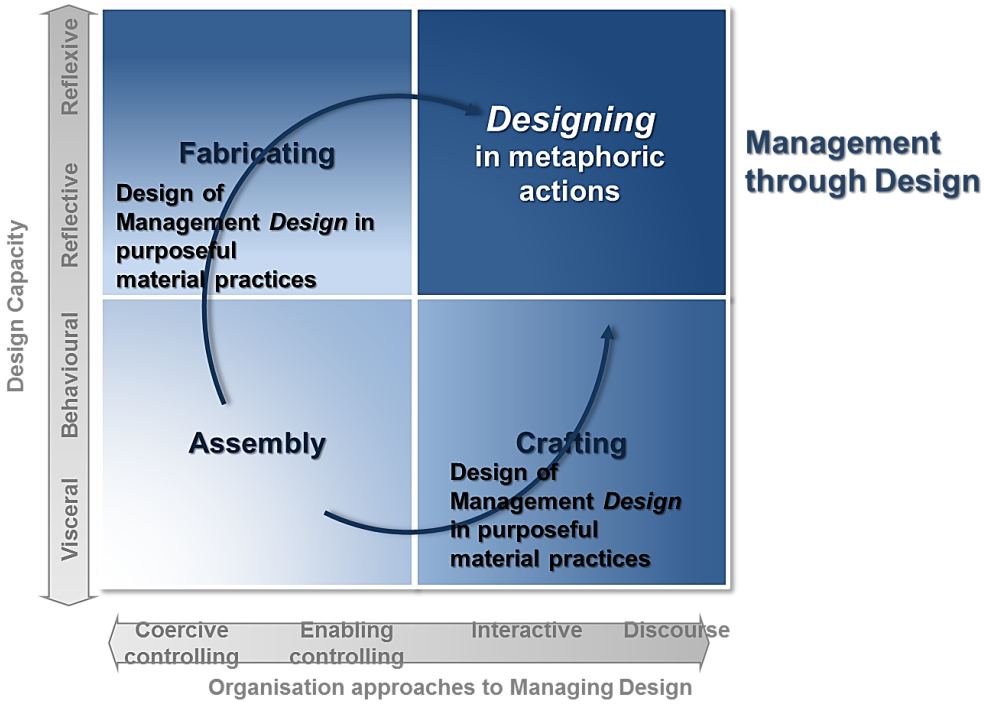


Figure 7.6 Two types of design management models in the matrix of organizational cultures regarding design practices

Types	Design capacity	Organizational approaches to managing design
Management through Design • Managing design practices from a viewpoint that design is carried out as a doing action to create human experience and the meaning of the product; symbolic design practices in terms of the enactment of organizational cultures	**Ambidexterity balancing between exploration and exploitation for achieving imaginative, pioneering but viable goals** • Uncertainty addressed and accepted • Reflective and reflexive design capacity that deal with what an organization has little 'experienced'	• Interactive and discourse types of organizational language used in managing design, which all inside and outside members accept • Considering diversity, irrelevant heterogeneity to respond to unpreceded events and to create new artefacts from the turbulence • Accepting uncertainty to foster a less hierarchical organization structure
Design of Management • Managing design practices as making and devising an object for organizations' purposeful material practices; purposeful/ material practice- based enacted organizational cultures	**Exploitation considered with regard to explicit benefits** • Risks concerned • Visceral, behavioural, limited reflective capacity shown in the use of design capacity for exploitative design outputs: dealing with what an organization or other organizations have experienced before	• Broadly controlling organizational language used; and limited interactive ways for exploitation • To manage measurable risks for feasible outputs • Controlling yielding another level of hierarchy in organization structure

Table 7.3 Types of design management models

7.4. Chapter Summary

This chapter draws the key matrix with regard to enacted organizational cultures in design practices: **Assembly; Fabricating; Crafting; and Designing** and the design management models were presented based on this matrix. These were identified in an examination of the features of large organizational cultures in digital landscapes.

For this, this chapter also illustrated how approaches to managing design can differ in terms of an organizations' absorptive design capacity: **visceral; behavioural; reflective and reflexive**; and also organizational approaches to managing design: **coercive and enabling controlling; interactive; and discursive approaches,** by encapsulating all insights drawn from this study.

By doing so, it draws two key models of design management: **management of design and design of management**. These models relate to conventional features of the design management model that have been addressed within a boundary of organizations' material practices. This was clarified by looking at different enacted organizational cultures in the East and West, in terms of considering evolving patterns of design practices in actual large organizations.

This thesis has shown how the different national cultures and historical background of material practices can influence the newly addressed concept of design practices, involving designing in increasingly competitive digital landscapes.

It is believed that the models presented will contribute to attracting new attention to the metaphoric concept of organizational cultures for ‘designing’, that emphasizes human enactment in itself.

8. Conclusions, Limitations and Future Research

8.0 Introduction

This chapter provides a brief summary of the foregoing chapters of this study to conclude this thesis. This is intended to address the study's theoretical and practical contributions with interpretations of this study. Also, it will present the limitations and challenges of this research.

The agenda for future research and the key questions that are tacitly drawn both from the author's personal experience and the implications of this research will also be discussed. In order to demonstrate the rigour of this research and the contributions, the publications[22] to which the author has already contributed are used as references (research outcomes, reviewers' comments, etc.). The chapter is structured as follows.

- **Overview of the Research Aim and Findings (Section 8.1)**
- **The Research Contribution (Section 8.2)**
- **The Research Challenges & Limitations (Section 8.3)**
- **The Future Research Agenda and Key Questions (Section 8.4)**
- **Summary and Concluding Remarks (Section 8.5)**

8.1. Overview of the Research Aim and Findings

This section outlines how this thesis began by restating the context and background of this research as well as the research questions.

8.1.1. The Research Context

The major motivation and context of this research are summarized as follows:

1) There is still confusion in relation to the concepts between traditional design and current digital technology-embedded product and service design, as the concept of design practice has

[22] The proceedings format publication listed:
1. Hwangbo, H, Cooper, R & Tsekleves, E 2015, 'Ambidexterity of design management in different approaches to digital design: review of organizational attitudes in the East and the West in new product development process' Paper presented at R&D Management Conference 2015, Pisa, Italy, 23/06/15 - 26/06/15,
2. Hwangbo, H, Tsekleves, E & Cooper, R 2015, 'Digital design in an international ecosystem: different approaches to managing design in the East and West' Paper presented at 11th European Academy of Design Conference, Paris, France, 22/04/15 - 24/04/15,
3. Hwangbo, H & Tsekleves, E 2014, 'Understanding of large Far Eastern organizational cultures in approaches to new product development process: designing versus controlling' Paper presented at 2014 R&D Management Conference, Stuttgart, Germany, 3/06/14 - 6/06/14,
4. Hwangbo, H 2013, 'Two worlds: design relativity in the complex world' Paper presented at Crafting the Future:10th European Academy of Design Conference, Gothenburg, Sweden, 17/04/13 - 19/04/13,

shifted from **design** for completed **outputs** such as aesthetics, styling, physical appearance and features in single and homogeneous hierarchical product system led by a single organization or a few professionals, to **designing** for incomplete and evolutionary **outcomes** towards completeness (Garud et al., 2008). With this shifting concept of design practice, designing is being addressed in decentralized and multiple hierarchical domains, such as digital platforms embracing physical hardware or intangible content and service design. This is led by multiple and heterogeneous types of design participants (Yoo et al., 2010). These design practices are carried out in globally co-created digital ecosystems.

2) The shifting design principles have, however, caused sensitive dilemmatic tensions between design participants in such an open environment, because there are different organizational understandings and approaches to the newer concept of designing: on the one hand, design is focused on 'outcome'; on the other hand, design is for 'output'.
3) The conflicts have been explicitly seen at the global digital ecosystem level, including issues of product design patents. Since digital technology-embedded product and service design has been led by large global technology companies, critical conflicts have been seen in the digital ecosystem. The design patent issues that occurred in 2011 in the race between Samsung, the South Korean technology giant and Apple, the US computer company, are to some extent loosely related to this. The way in which designing is defined could cause different understandings of the term 'designing', which could be interrelated with organizational and national cultures.
4) However, there have been fewer discussions about the relationship between the shifting design rules and organizational approaches to managing such design practices (Yoo et al., 2010). It has been rarely discussed from international and cross-cultural perspectives, despite the significance of understanding the impacts of races in the global digital ecosystem. In particular, organizational cultures of the large Eastern and Western organizations have not been discussed before in design studies.

When considering these issues, design management studies should consider the emergent interactions between organizations and product and service design from the perspective of artefaction. In this sense, organizational culture studies are central to understanding such tacit elements in design practices which contain human enactment and it is believed that cross-cultural studies from Eastern and Western perspectives can help us to identify the significant implications by looking at the differences and similarities found in organizational contexts.

This thesis uncovered the fact that enacted organizations are seen differently when carrying out design practices by examining enacted organizational cultures in the East and West.

8.1.2. Synthesizing: The Findings and Discussion of Research Questions

8.1.2.1. The research approach

In order to examine the given issues, this study began with the following four research questions:

- **RQ1: Do national culture differences influence individual organization cultures?**
- **RQ2: Does the organizational culture influence the new digital product design in the organization?**
- **RQ3: How does the organization culture influence new digital product development?**
- **RQ4: How is the organization culture reflected in the resulting digital product design?**

The above questions were formulated with an in-depth understanding of the epistemologically consensual stances between product (and service) design and organization studies. The questions were thus intended to identify a relationship between organizational approaches to managing design (i.e. managing new product and service development projects) and the features of enacted organizational cultures, by examining large organizational cultures that represent East and West.

The research questions were developed based on a review of literature regarding design, innovation, management science, information systems, organizational cultures, organization science and research and development (R&D) management studies with the author's personal interest in the research topic.

Before commencing the doctoral research, the author was able to observe these issues first-hand, as an experienced design and marketing practitioner in large global manufacturing firms in South Korea between the years 2006 and 2011. During this time, the author was involved in a wide range of relevant projects such as design management (NPD, design and branding management), organization change management and innovation. In 2011, the author was involved in a relevant innovation project at a global large manufacturing firm when the product patent issues occurred between Samsung and Apple.

Based on this personal experience, since late 2011 when this PhD research project commenced, this study has focused on identifying the implicit and tacit elements in an examination of the enacted organizational cultures related to human enactment in design practices. This was carried out in two phases of qualitative dominant-mixed methods approaches by using abductive reasoning. Between 2013 and 2014, in-depth interviews were conducted with 29 participants who worked as design, new product development, business management, innovation and marketing professionals in various fields of product and service design, engineering design, R&D management and design and management research. A broad range of qualitative and quantitative data sources, including newspapers and

business periodicals, corporate income statement reports, annual reports and public research reports, were analyzed to ensure utmost rigour in the research.

Accordingly, this research has been expanded to take into account digitalization embedded in design, by investigating mechanisms used in 'digital platform strategies' between the selected organizations. In doing so, this study can avoid the abstraction of traditional design and organizational studies that deal with human enactment. Thus, this study could more specifically explain the relationships between enacted organizational cultures and the newer design practices, designing, from cross-cultural perspectives.

8.1.2.2. The research questions and the answers

In accordance with the research questions, the research findings will be individually revisited with the answers, as follows:

RQ1. Do national culture differences influence individual organization cultures?

Large organizational cultures are likely to be shaped by a national culture. This is reflected in the process of carrying out complex design practices, as the complexities of design practices are subsequently influenced by an organization's enacted mechanism. The enacted mechanism is associated with material practice-based organizational cultures containing **purposeful and instrumental actions**. The different enacted organizational cultures in the East and West more clearly reflect the mechanisms in complicated design practices for digital new products and services. It can be summarized as follows:

- As shown in existing literature (section 2.2.4), in carrying out complicated design practices, large organizations' collective attitudes were likely to reflect a national culture. This is because the design practices are conceptualized and structuralized through an organization's formal and informal structures that formalize its artefacts (see also Hofstede, 1994; Hofstede et al., 2010). It was also reflected in design practices for new digital product and service development in Eastern and Western organizations, and it also affects their design priorities (section 5.1.4; and also Table 5.2). Different shared social values such as educational attainment, tolerance against diversity, and perception of groups and individuals can affect formalizing design practices (manner of communication and information transfer) at an organizational level.
  Looking at the detailed concepts of material-based organizational cultures (i.e. cross-cultural and corporate cultures) the elements that can affect actual design practices were identified for analysis. In cross-cultural perspectives, the different enacted organizational cultures in the East and West (section 5.2.1.1.) are likely to be inherited from different industrial and material mechanisms. This includes design professionals along with national economic growth, different

perceptions of the organization and individual members. In terms of corporate cultures, the elements are found in an organizational adaptive mechanism: an organization structure that deals with complex technology and the information such as the administrative structure, leadership, and surrounding market environment (section 5.2.1.2). These represent how organizations deal with complexities in design practices that contain sociotechnical contexts. It was in fact illustrated differently in organizational design practices from normative and formal organization structure to informal, tacit and implicit attention structure (Section 5.2.1.1 & 5.2.1.2).

- The features of enacted organizational cultures in the East and West are therefore explicitly seen in design practices. The Eastern organizational attitudes – collectivism and higher power distances – can enhance intrinsic collaboration along with a leader's internal empathy in a short time and efficiently; yet, this often requires an explicit demonstration to manage visible risks (note Section 2.4.1.2; see also 6.3.1.3). In the process, exploitation is overwhelmed and followed by political manoeuvring to achieve short-term oriented design outputs. Such political tensions in attention structure causes much tighter-coupled organizational structures and makes them expect more feasible design outputs rather than creating something new.

RQ2. Does the organizational culture influence the new digital product design in the organization?

The findings of the empirical data demonstrate that large organizational cultures are likely to influence how organizational design practices are carried out, i.e. new digital product and service development when examining organizational cultures in the East and West.

- The answer is demonstrated when constructing the mechanism of enacted organizational cultures that appears in design practices. In a process of carrying out complicated design practices one enacted organizational culture is greatly discerned from others, when looking at the mechanism presented in the map of enacted organizational cultures: an **organization's early domain definition – hardware and software; organization structures – normative and behavioural structure; and attention structure concerned with perceptual controlling variables regarding exploitation.**
  The mechanism is reiterated in the following question.

RQ3. How does the organization culture influence new digital product design and development?

As noted in the above question, it is found the detailed mechanisms surrounding enacted organizational cultures that affect approaches to managing design to be as follows:

(1) ***Organizations' domain definitions – hardware and software***

There are clear territories in large organizations' early domain definitions: hardware and software. This causes inertia in creating new digital products due to tacitly nurtured design methodology across an organizational structure within an early domain definition. It is also clearly seen in the large Eastern and Western high-tech companies. The Eastern companies have hardware-centric domains; whereas those in the West are established in a software grounding. The inertia of a given domain structure is seen as a challenge in a process of integrating heterogeneous design elements to design new digitalizing artefacts as a whole.

(2) Organization structures: normative and behavioural structure

An early domain definition subsequently affects organizational structure along two levels: normative structure – perceivable and formal; behavioural structure – informal and member's sentiments, representing the power structure and the members' socio-metric structure.

- A normative structure is likely to be inherited from an initial domain definition of an organization e.g. hardware or software, and it forms its own structure that can create inertia later and shape its own approaches to design: a reductive or holistic approach.
- However, the implications drawn from behavioural structures show the cross-cultural differences between the Eastern and Western organizations related to informal power structures in design practices. The informal power structures are seen as causes which form multiple and invisible layers of hierarchy and this leads to a lack of agility in a decision-making process. It also affects designers' sentiments about their own design practices. In the Eastern organizations, such confusion that exists between normative and behavioural structure causes significant conflicts in carrying out complicated digitalizing product and service design practices, as concerned with such an informal power structure.

(3) Perceptual controlling variables concerned in attention structures

The features of enacted organizational cultures can be distinguished when looking at organizational attitudes to perceptual controlling variables in attention structures. The more complicated a product and service design process is, the more tacit and implicit understanding of those details is required in order to accomplish multi-layered digitalizing artefacts consisting of heterogeneous design elements, such as hardware and software elements. However, the tacit organizational capacity is fundamentally hindered by concerns about such explicitly emerging perceptual controlling factors – allocation of resources and timeline management – in its own attention structure. It also implies different attitudes towards risks or uncertainties.

- Because those perceptual controlling factors – limited timeline and allocated budgets – are likely to exist in any organizations that have explicitly considered such predictable and expectable **risks using their own measurement theory**, this is shown in product strategy such as expanding product line variations.
- The patterns, however, differ by domain definitions – hardware vs. software. Hardware domains are far more concerned with perceptual controlling factors due to their resource-based design approaches for manufacturing with engineering methodology; whereas, software domains focus on unprecedented uncertainties because this deals with human interaction with their product and service.
- These key features are also illustrated in Eastern and Western organizations. The East featured relatively complicated attention structures to deal with their own domain products and services – i.e. hardware; whereas, the West are characterized as a loosely-coupled attention structure as they deal with a loosely-coupled software service design.

RQ4. How is the organization culture reflected in the resulting digital product design?

In order to explain the abstraction of this question, this study took into account a concept of platform as a design outcome and manifestation of an organization, because the terminology of the definition can represent a relationship between organizational contexts and design practices (section 5.3; see also Baldwin & Woodard, 2009; Ulrich & Eppinger, 2012).

- In relation to this, this study examined differences between traditional notions of platform and digital platform. A traditional platform infers a fixed and stable domain for accomplishing a single product design; yet, a digital platform implies its generative and evolutionary design practices *per se*.
- When looking at digital platform strategies in selected cases in the East and West – Sony, Samsung, Apple, and Google – there are differences between them related to those enacted organizational cultures. The East Asian organizations' digital platform strategies – Samsung, Sony – are featured in 'tipping' strategies, focused on generating new product lines in reductive and exploitative design approaches. Whereas, the Western firms' strategies – Apple and Google – are shown as 'coring' strategies that utilize their own digital platform.

The research findings therefore demonstrate that there are different approaches to managing design in the East and West. It also outlines the mechanism of enacted organizational cultures in design practices based on theoretical and empirical evidence.

8.2. The Research Contribution

The contributions of this study cover several interdisciplinary subjects such as design management,

innovation, R&D management, organization and international business studies. This section will discuss this in two areas: (1) developing design management studies in digitalization; and (2) building a design research in consideration of design epistemology.

8.2.1. Developing Design Management Studies regarding Digitalization

This study contributes to developing design management studies in response to the era of digitalization as follows:

- **Clarifying the nuanced meaning of designing**: This research presents a detailed framework, the 'Matrix of Enacted Organizational Culture in Design' and refined the design management models (Figures 7.1 & 7.6). It provides the reader with a deeper understanding of what holistic design is for 'designing' by identifying the required elements in design capacities and organizational approaches to managing design. In particular, this study has attempted to clarify the meaning of designing by constructing the enacted mechanism of organizational cultures. It summarizes different organizational attitudes towards **'risk'** or '**uncertainty**' in dealing with designing. An organization is more tempted to manage **risks** with **measurable logics** because it has rarely experienced such uncertainties in managing heterogeneous elements in designing, so that it results in assembly, fabrication or crafting culture towards existing design outputs. On the other hand, some organizations are likely to perceive uncertainties as new opportunities because they have implicit capabilities to understand uncertainties in devising their design outcomes.

  In order to deal with designing towards innovation, organizations should balance those with ambidextrous capabilities to deal with certainty and uncertainty, exploitation and exploration. The implication of ambidexterity is validated by a previous publication presented in 2015 at the R&D management conference in Pisa, Italy as below (see Hwangbo et al., 2015b):

  > "I would strongly invite the authors to clarify the theoretical contribution the paper aims at providing. Considering the fact that the track is about the interplay between Technology and Design, I would invite the authors to discuss this relationship in the digital design."
  > (Reviewer in 2015 R&D Management conference)

- **Bringing new attention to designing in digitalization and organizational contexts**:

  This study helps shift academic interest in 'design' that has been focused on a limited boundary of design practices, such as usability for users and design professionals at their work practices, into broader sociotechnical contexts. It embraces organizational, national and industrial contexts with an understanding of 'designing' from evolutionary perspectives (section 2.1.3). This study on enacted organizational cultures in design practices from cross-cultural perspectives can prove this,

as it attempted to clarify the nuanced concepts of 'designing' from international and human enactment perspectives at organizational level. In fact, there have been critical efforts towards sociotechnical contexts in other areas, such as attempts to identify a relationship between 'technology design' and work practices in participatory design studies as applied to computer systems and automation increases in offices and workplaces (Grudin, 1993; Bodker & Pedersen, 1991; Rheinfrank et al., 1992) and discussions about design rules in economic and organizational contexts related to complexities in structures, functions, hierarchy, design parameters of artefacts in management science, and computer science studies (Baldwin & Clark, 2000).

However, in pure design studies, there has been lack of interest in such sociotechnical contexts. This study is the first that attempts to provide a new understanding of enacted organizational cultures and new design practices, 'designing' from cross-cultural perspectives in digitalization.
In this context, this study draws new attention to designing by comparing different organizational cultures and identifying the relevant features. It also crystallizes how the organizational cultures are enacted in approaches to managing design from the perspectives of East and West.

- **Considering actual design contexts**: unlike pure academic design research, this study was initiated by looking at actual high technology company cases situated at the centre of digitalization to consider their organizational contexts and design practices. In order to examine these, the author has attempted to approach this study from different perspectives and multiple angles: digitalization, organizational cultures and international and cross-cultural respects. This is shown in the reviewers' comments to the author's earlier publications:

"This paper sets out to discuss "How different national cultures influence the construction of product design and how differently national cultures could influence the meaning of design in complex organizations". Then follows a theoretical section cover[ing] several areas, innovation, vocabularies of product and organization as well as flexibility, and further a section relating organizational culture, nationality and the product. Then a 'case' is presented being the lawsuits series between Apple and Samsung. This is then used for discussing the meaning of design in the different organizations. Good…."

(Reviewer in 2013 10th EAD conference)

"NPD and 'openness' become more and more interlinked during the past decade. - Understanding the differences between east and west is of high importance for both sides, especially since globalization and development of products in cross-cultural teams is normality for a high number of companies. Lessons learned from the different cultures are important for evolution of NPD process. Further research should examine the impact of the implementation of far eastern organizational culture in western companies and vice versa. It would be interesting to get insight into success stories if data and information is already available."

(Reviewer in 2014 R&D management)

Based on such contextual understanding, this study revealed that different approaches to managing design exist in carrying out digital technology product and service design practices in Eastern and Western organizations. It has shown a different meaning of design in the East and West; complex territorial issues between hardware and software domains; and the importance of tacit capacities to deal with those shifting concepts of design practices.

- **Design semantics from organizational perspectives in digitalization:** This study provides a new understanding of design semantics[23] in organizational contexts. There have been critical discussions on the improvement of usability design in organizations, for instance, system design and equipment design at workplaces (Adler & Borys, 1996; Bodker & Pedersen, 1991; Grudin, 1993). However, design semantics in those studies have been addressed in discussions about a relationship between users (workers) and artefacts (equipment and interactive system), so that the focus has emphasized how artefacts interactively communicate with the users only. However, this study finds that there are already decisive organizational languages that affect design semantics by looking at organizational cultures in the East and West. **The East – a formalized and one-way language towards design output; the West – a less formalized and conceptual language enabling two-way communications for design outcomes (section 5.1).** Accordingly, the organizational languages impact on the results, product and service design semantics: the Eastern organizations focused on the '*featuritis*' of product and service design underlining tipping strategy; whereas, the Western organizations focused on coring strategies with established platforms (section 5.3).

  The author contends that the studies on design semantics should therefore consider enacted organizational cultures as those acting as decisive factors to form product and service semantics.

8.2.2. Building a Design Research in Consideration of Design Epistemology

This study was carried out with an understanding of design epistemology and the methodology to build a specific design research framework. The main reasons are addressed as follows:

- Previous design research in academic areas have considered design epistemology and methodology less fitting to the epistemology, as they have replicated their own methodology using pure qualitative approaches within a constructionist paradigm. Some research outcomes and methods of analysis even showed separation from contextual issues and practical solutions,

[23] Semantics, the expression of meaning through form: the study of the sign's message- i.e. the meaning of the sign: this study is rooted in study of semiotics (the study of meaning or the study of sign) (Monö, 1997; Rheinfrank, et al., 1992)

although design research should consider multiple and contextual issues from pragmatic perspectives (Garud et al., 2008; Aken, 2007; Aken, 2005). In consideration of this, this research is designed to fit design epistemology. It leads to the establishment of an individual research methodology: a case study that can triangulate such contextual issues by utilizing mixed methods – qualitative and quantitative data sources. It can have critical implications that can reflect the contextual issues of design management. This was validated in reviews of one recent publication presented at the 11th International European Academy of Design Conference in 2015 (see also Hwangbo et al., 2015a):

> "The purpose of that paper consists in putting into evidence cultural features that influence the design "milieu" in digital industry. The empirical martial consists in two sets of interviews conducted within innovation experienced workers."
>
> (Reviewer 1 at11th International European Academy of Design conference in 2015)
>
> "The quantitative table n°1 must be more critically presented. In particular, the method by which the creativity index is calculated must be explicitly exposed. In contrast, the criticism of Hofstede's assumptions (page 12) looks more solidly grounded thanks to the authors' empirical study. Apart from those remarks, the text does not need modification…"
>
> (Reviewer 2 at 11th International European Academy of Design conference in 2015)

To conclude, this research provides a wide range of benefits to academic researchers and practitioners in the fields of design, innovation, organization, R&D management and business and management, by opening new perspectives on design research and expanding the areas of design management studies embracing organization and digitalization.

8.3. The Research Challenges and Limitations

This research still has some limitations. This section will address how this research has been challenged. Although this study began with ambitious plans drawn from the author's personal interest and experience, there have been several challenges faced in these areas: (1) the research scope; (2) research approaches: data collection and analysis.

8.3.1. The Challenges and Limitations in the Research Scope

First, the challenges were oriented from the initial interest in global design patent issues between Apple and Samsung because the context behind the issue should be considered in a wide range of theories and practical discussions such as digitalization, design, international business and management and innovation issues. The author was challenged to find the particular link between all

those issues. This is reflected in the comments of a reviewer to the author's 10th EAD conference proceedings paper held in 2013, Gothenburg, Sweden:

> "There is something intriguing with this paper, taking an approach to understanding design-innovation and meaning through the recent patent claims between Apple and Samsung. The paper is ambitious! The theoretical background covers a lot of ground, I'm even suggesting a bit too much. I do believe that there is something here that is worth further exploring and that the author has the capabilities of doing so by being a bit more stringent in the reasoning."
>
> (Reviewer at 2013 10th EAD conference)

However, when considering such broad research domains, this research can avoid not remaining in the traditional design study areas by adding multiple angles such as innovation, R&D management, and organizational culture and cross-cultural studies. In doing so, this study can help provide new research opportunities in future design studies.

8.3.2. The Challenges and Limitations in the Research Approaches

The challenges and limitations of this research were also found in the research approaches: (1) **data collection** and **(2) validity and reliability issues**:

(1) Challenges in data collection: whilst gaining tacit insights about enacted organizational cultures in design practices in the East and West, there were challenges in data collection. Accessing reliable design professionals who have in-depth insights into the differences between the large Eastern and Western organizations was a significant concern for rigorous research. In addition, accessibility and distance issues of those participants, and confidentiality issues about highly reliable data, were raised.

Accessibility and distance issues for cross-cultural studies: this research was conducted in Lancaster, in the north-west of England. However, there were no large global companies in the area that could demonstrate global design issues, such as Samsung, Apple, Microsoft, Sony and so on. This issue had already been raised in the pilot study and literature review, so the author was able to consider how to maximize analogical reasoning with the limited range of samples and cases. To test this, online-based data collection was conducted first in the pilot study phases. However, this still showed limitations to obtaining in-depth insights on enacted organizational cultures and the details. In the main study, therefore, the method of data collection was changed to person-to-person expert interviewing, and the samples were limited to design and new product and service development professionals who have had experience dealing with large global companies' design projects. These project-based groups represented external and internal organizations in carrying out the new product

and service development projects (Section 3.4.3). Accordingly, in order to overcome the regional issues, all participants were selected from London-based leading UK design and innovation consultancies (six relevant design and innovation consultancies), US management consulting firms (two business and management and information technology consulting firms), and internal employees who worked for large global technology companies. In some cases, if a participant had a concern about confidentiality and anonymity issues the interview was conducted by online-based interviews: skype calls and email.

Confidentiality issues: since this research dealt with high-level reliable data such as organizational issues in high-tech new product design, some participants were reluctant to speak about the details of their projects. In particular, some respondents were involved in projects such as intellectual property or breakthrough innovation projects hesitated to comment.

(2) Validity and reliability issues: Since this research employed qualitative dominant research approaches, it implies significant limitations in terms of validity and reliability issues, as positivists have concerned in organization and design studies (Section 3.1.4; also see Crilly, 2015). Especially, in this study the theory suggestion (Chapter 7) and findings drawn from self -reporting interview data from limited numbers of interviews may involve some concerns. In order to overcome such limitations, this study carefully designed its research approach from research methods(e.g. in-depth interview, email interview & secondary data collection), sampling strategy and data analysis in line with its own case study approach: embedded multiple case studies. As highlighted in Section 3.3.3, this study used not only a range of qualitative data sources for the survey research methods, but also quantified data sources derived from secondary data. The validity is thus 'constructed' by triangulation of those multiple data sources (Table 3.9 in Section 3.3.3.). Samples were also carefully recruited within specifically designated groups (NPD project relevant groups) to draw the best analogy, which can transfer best knowledge to the author on their design project experiences (Section 3.4.3.1). Accordingly, data analysed were rather initiated by ideas aimed to construct a pattern and mechanism in line with abductive reasoning (Section 3.1.4; 3.4.3; 3.5), rather than to generalize them for testing or saturating a theory.

Yet, despite such efforts, this study could not identify specific relevancies between the findings. Although this thesis denied such naïve empiricism in organization and design studies that deal with eclectic human enactments (Section.3.1.3; 3.2.3), the criticism from strong positivists that claim validation of the study is also concerned.

For instance, with regards to the matrix presented in Section 7.3 this quadrants and matrix were purely drawn from analysis of qualitative data sources from interviews and secondary data and studying of limited cases of a few digital tech companies. Although digital design outcomes- digital platform and

the ecosystem- are dominated by the US ruling Western companies and their approaches and it can prove with explicit quantitative data (in 2015, Silicon Valley based 44 digital platform providers capitalise a worth of $2.2trillion) (The Economist, 2016), the facts are still being controversial. Because, in the Eastern Asia, for instance, emergence of Chinese digital tech companies, such as Xiaomi and their aggressive approaches to building their own digital ecosystem supported by their government can be also regarded as great achievement of digital innovation(Section 7.3.1). Their explicitly overwhelming outcomes cannot be ignored in discussion of whether or not design practices and organizational culture for the practices have evolved through certain metaphoric turbulences. It is challenging that Western approaches seem to dominate currently digital ecosystem and designing cultures.

In fact, this study does provide a little scientific explanation: for instance, to what extent national cultures are likely to be related to the large Eastern and Western organizational cultures, or whether a firm's domain definition is likely to be aligned with national economic progress and how it is related to a firm's absorptive capacities.

In this sense, to address such limitations in data collection and validity issues, a future research should be considered about different qualitative research methods that can look into more detailed mechanism between design practices and organizational cultures; and also quantitative research approaches in support of the qualitative research approach. For instance, when it comes to considering about such dynamics of digital design worlds and more robust validity on the suggested theory (Section 7.3), longitudinal cross-comparison studies about the selected cases addressed in this thesis can be considered. In line with this, deeper approaches to the case study can be also considered, such as observation and in-depth interviews with design professionals, which are situated in actual professional settings in the companies. Participatory data collection (e.g. attending and observing meetings in a design project) can address detailed implications on a relationship between digital innovation, the design practices and organizational cultures (also see Crilly, 2015).

Furthermore, based on the all variables drawn from the qualitative research, the author also expects future researchers to have more detailed explanations about those issues and examine some relevancies between variables in quantitative approaches for the reliability of this research.

8.4. Future Research Agenda and Key Questions

This study too identified that there are opportunities for future research, as this research covers several interdisciplinary subjects from design management and organization studies to innovation studies from international perspectives. Based on insights from this study, this section outlines the following future research agenda with the key questions:

(1) 'Designing' and 'organization transformation' with a focus on evolutionary artefacts in digitalization

Looking into concepts of designing in digitalization, this study brings a new understanding of the challenges that lie in creating evolutionary artefacts in traditional organizational contexts. In particular, different conceptions between risks and uncertainties in organizations are the concern of creating and introducing new evolutionary artefacts. There would be many issues about integration, aggregation, distribution and diffusion between man-made artefacts that employ the concept of digitalization and the organizations that make those decentralized artefacts. Thus, it raises a question about how creating an evolutionary artefact can affect organizational adaptive systems.

In the meantime, this study also needs to consider the substantive issues in creating an evolutionary artefact in organizations: openness and governance; heterogeneity and homogeneity; territorial issues of traditional organizations representing software domains and hardware domains; and tightly-coupled vs. loosely-coupled organizational structures. Based on this, the key questions are as follows:

- How can the concept 'designing' be applied to future design management studies that research everyday evolutionary artefacts in digitalization, including all the ranges of complex systems such as buildings, society, community, policy, and interactive systems design?
- How can traditional organizations be transformed to embrace generative design practices for creating evolutionary artefacts and what is the role of design management study in consideration of the shifting organizational contexts for creating evolutionary artefacts?

(2) Absorptive design capacity for designing and enacted organizational cultures

This study provides an understanding of absorptive design capacity and organizational approaches to managing design to explain enacted organizational cultures in design practices (Chapter 7). However, this study still has limitations when identifying and examining the relevancies between those concepts. In particular, in national cultures, large firm's activities in design practices and the tacit insights on enacted organizational cultures affecting absorptive design capacities are not easily generalized with the limited size of samples and data sources. In particular, although business culture and systems have been discussed in the units covering East Asia (China, Korea, and Japan) and the West (Western European countries and North America), (Whitely, 1992) there are limitations to demonstrating the significant organizational features that affect design practices.

Furthermore, Chinese issues – e.g. business models and the culture – have currently become popular in relevant studies, such as innovation and technology management (Reeves et al.,

2015; Corsi & Minin, 2014). However, those studies have still shown some limitation due to a lack of tacit understanding of the national contexts and the size of research domains. This gives rise to the following questions:

- How have national cultures affected absorptive design capacities at the organization level in consideration of different organizational approaches to managing design in the East and West?
- How do organizational approaches to digitalization differ in the East and West?
- How are individual design professionals affected by an enacted organizational culture in a process of accumulating an organization's tacit design capacities?

(3) To find practical solutions about creating evolutionary artefacts and organizational transformation

This study brings new attention to digitalization, design practices in the era of digitalization and the organizational contexts by an examination of the cases of large Eastern and Western organizations. However, this study has not yet presented any practical solutions to resolve the constant challeges in these circumstances. The author believes that future design management studies should consider practical solutions for organizations and actual design practices in the era of digitalization, such as sustainable business models for evolutionary artefact design and the shifting logic of organizations. These are practical approaches to configuring organization structures in consideration of implicit organizatonal cultures. The key questions related to those issues are presented as follows:

- What is an applicable business model for creating evolutionary artefacts considering the elements of implicit organizational culture?
- How should organization structures be transformed to overcome such implicit challenges of behavioural structures in order to create decentralized evolutionary artefacts?

(4) ***Further critical discussions on design research to study 'Designing'***

There is still confusion in design epistemology. Design studies are often posited in naïve constructionist stances, although it has great potential to present decisive solutions such as positivist approaches. In many respects, epistemologically, design research and the design paradigm are rooted in pragmatism where the completeness (positivism) and incompleteness (constructionism) co-exist, as it aims to solve field problems (note Section 2.1). The research paradigm will be more significant as all kinds of man-made artefacts become evolutionary ones – digitalizing artefacts, which contain completeness and incompleteness together spontaneously. One key question is raised:

- How can design researchers contribute to developing actual solutions in the era of digitalization in consideration of such evolutionary artefacts and the eclectic sociotechnical contexts?

8.5. Summary and Concluding Remarks

The author notes that this thesis aimed neither to suggest clear boundaries of organizational cultures in the East and West, nor to clarify better design approaches that might be applied to either from the other side. However, this study was aimed to offer a new understanding of managing design in the era of digitalization, by examining the detailed contextual issues, enacted organizational cultures in the complex design practices from international and cross-cultural perspectives.

Accordingly, implications from this study can be applied to a broad range of design studies that require deeper understandings of relationships between organizations and complex design practices. Design and design management studies have been narrowly discussed about how to create new artefacts and how to manage complex design practices, and these have been discussed by different design disciplines, separately. As design practices are complicated and the knowledge is required to be integrated to create one artefact, it becomes important to identify commonality between heterogeneous knowledge domains and to understand relationships between actual organisational contexts, design domains and design practices in creating new complex artefacts. These issues however have been discussed recently in centre of engineering design studies (e.g. Crilly, 2015; Youmans & Arciszewskia, 2014; Chen & Crilly, 2016). In relation to this, this thesis contributes to bringing new questions about design, design management and innovation studies in the digital age, which are also useful to be applied to future technology-embedded artefacts design in actual organisational settings, such as*:* ***how can an organization make its complex design practices encouraged or discouraged within its domain and own design contexts?; how can an organisation deal with increasing heterogeneous design elements of unprecedentedly coming leading-edge technology in approaches to managing such complex design practices?; how are these interrelated to organizational cultures?; and how can an organization approach to manage complex design practices between formal organisational structure and behavioural organisational cultures in achieving its innovation?*** Discussions of this thesis about heterogeneity, modularity and uncertainty and risk in approaches to managing digital design will be helpful for future design management studies to develop the questions.

This study will therefore not only help to provide readers with an in-depth understanding of ‘designing’ in the era of digitalization in global circumstances but also make significant contributions to expanding areas of design management studies and attracting new attention to design studies in the era of digitalization.

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Appendices

A.1. Interviewees list

A.2. Interview data from main study

A.3. Secondary data sources for main study

- **A.3.1. Top management's profiles of the selected cases and the organization structures**
- **A.3.2. The selected cases' financial data (sales revenues, operating profits and margin rate) breakdown (sources from the selected cases' earning reports and annual reports)**
- **A.3.3. R&D expense and R&D intensity of the selected cases**

A.1. Interviewees list

Pilot Study								
Email received date		Language in use	Nationality	Work experience countries	Background			Job position
					Professional	Academic	Work experience(years)	
22/08/2013 17:12	**JH**	Korean	Korean	Korea	Engineering Design in R&D, Product	BA Electronics	7.5	Assistant manager
30/08/2013 09:05	**YR**	English	Korean	Canada, Korea, Singapore	Design (Graphic, Industrial, Environment, Product etc.,)	MSc Innovation, BA Design, Fine Art	7	Senior Designer
01/09/2013 00:26	**TY**	Korean	Korean	Korea	Design (Graphic, Industrial, Environment, Product etc.,), Engineering Design in R&D	BA, Graphic design	10	Senior manager
06/09/2013 11:12	**JJ**	English	Korean	Korea, Singapore	Design (Graphic, Industrial, Environment, Product etc.,)	BA, Industrial design	14	Senior manager of user experience design
13/09/2013 22:27	**N**	Korean	Korean	US	Design (Graphic, Industrial, Environment,	PhD design	over 20	Associate
17/09/2013 09:11	**UC**	English	Japanese and British	UK, Japan, Mexico, Germany	Design (Graphic, Industrial, Environment, Product etc.,), Engineering Design in R&D	Product Design Engineering M. Eng	4	Product Designer / Project Manager
24/09/2013 06:02	**JW**	English	Singaporean	Singapore	Design (Graphic, Industrial, Environment, Product etc.,), Design Research	Bachelor of Engineering	8	Sr User Experience Consultant
27/09/2013 12:24	**MG**	Japanese	Japanese	Japan, UK	Design (Graphic, Industrial, Environment, Product etc.,), Engineering Design in R&D	Architecture		Design Project Lead
27/08/2013 18:19	**GF**	English	British	UK, USA, China	Design (Graphic, Industrial, Environment, Product etc.,), Engineering Design in R&D	Marketing	18	Director
29/08/2013 22:31	**EG**	Canadian	Canadian (UK permanent resident)	Based in UK (29 years), Sweden (1 year) : UK, USA,Canada,France,Holland,Belgium,Denmark,Sweden,Finland,Norway, Germany,Italy,Spain,Latvia,Taiwan,China, Malaysia, HK, Japan, Korea, Singapore, Australia	Design (Graphic, Industrial, Environment, Product etc.,), innovation strategy, UX + service design	BENg, MDes(automotive)	30	Chairman
01/10/2013 09:48	**MT**	English	British	England, Hong Kong, Korea	Design (Graphic, Industrial, Environment, Product etc.,)	MA Industrial Design	16	Associate Design Director

Main study											
Interview Date		Work place country	Language in use	Nationality	Background				Interview Types		
					Occupation	Job position/ Work experience (years)		Education	Email & feedback	Skype	Person to Person Meeting
11th Mar 2014 (Skype) 20th Mar 2014 (Personal meeting)	**MT**	UK	English	UK	Design consultant	Creative Director	Over 20	MA, design		O	O
13-Mar-14	**SH**	Korea	Korean	Korean	Semiconductor chip design	Assistance manager	over 9	BA Electronics engineering	O	O	
09/04/2014(personal meeting) 3 May 2014(email received)	**JH**	Korea	Korean	Korean	Digital platform provider :e-Book platform	Co-Founder	14	M.S., Astronomy	O		O
16/04/2014	**SW**	UK	English	Taiwan	Design researcher/ Design consultant		over 10	PhD, Design	O		
29-Apr-14	**TK**	UK	English	Japanese	Designer(Concept design, design research, product & service design, UX/UI, Brand identity)	Senior Designer	over 7	MA Industrial and Strategic Design	O		O
29-Apr-14	**WH**	UK	English	Chinese	Project manager & Designer(concept design, designing for production, pre-sale consultancy, project management, client management)	Senior Designer	over 8	M.A Industrial and Product Design,			O

02/05/2014, 11/07/2014	**JT**	UK	Korean	Korean	Service Designer and Design	Service Designer	9	MA, Design		O	O
23-May-14	**DN**	UK	English	Singaporean	GUI Designer working for an East Asian tech company	Senior GUI Designer	over 15	BFA, Graphic Design	O		
15-Jun-14	**SY**	Korea	Korean	Korean	Design Researcher and Coordinator	Design Coordinator	over 6	MA, Design, Strategy & Innovation	O	O	
5 June 2014 (Personal meeting) 17 June 2014 (email)	**UW**	Germany	English	German	Business Consultant : NPD process software system company	Senior level	Unknown	unknown	O		O
19-Jun-14	**EG**	UK	English	British	Design consultant	Chairman & founder	over 30	MDes Industrial Design, Transport, Computers			O
21-Jun-14	**JC**	Korea	Korean/English	Korean	Management consultant	Senior Associate	over 12	MBA ,MS, BS, Mechanical Engineering		O	
03-Jul-14	**DT**	UK	English	Singaporean	Design Consultant	Senior level	over 10	MA, Design Studies			O
17/07/2014	**VL**	UK	English	British	Interaction Designer working for a Western tech company	Senior level	over 10	B.A. Interaction Design		O	
21-Jul-14	**GF**	UK	English	British	Design consultant	Director	over 18	BA Hons, marketing communications			O

16/08/2014	**JH**	Korea	Korean	Korean	Design Strategist, Industrial designer working for an EAST Asian tech company	Assistance manager	10	MA. Industrial design		O	
19/08/2014	**RB**	UK	English	British	Design Engineer and design consultant	Senior Design Engineer	7	MEng, Mechanical engineering and product design	O		
02/09/2014	**JJ**	US	English	American	UX designer working for a Western tech company	Sr. Interaction designer	over 10	MA, Interaction design		O	

A.2. Interview data from main study

Interviewees	
DN	
1	Hierarchy is very important in my current company. I find that Korean colleagues in Seoul do not speak up nor voice their opinions if theirs are different from their superiors'. Following orders is the routine. However, at the London office, non-Korean colleagues would challenge ideas no matter whom they come from.
2	I find that European company I worked previously valued high quality of design and it usually provided a sufficient timeframe to complete the project. On the contrary, at my current Asian company, it expects to achieve result in half the time available due to the lack of proper planning and overall strategy
3	Not reacting to market or current trend, should not be playing catch-up to competitors. Be able to foresee the future. Having a vision is the key to innovation in design
4	The European company I worked previously had a reputation on innovation which demonstrated vision for the future. Ideas and design were generated without worrying whether the result would generate financial gain for the company. However in my current company, profit is the main driver which sometimes can restrict wild ideas that could lead to something bigger in the future.
DT	
1	**I got a couple of questions from this. You used to work for Dell in Singapore…you used to work for dell in Singapore. And you also work at here in the UK. But both of organizations are a type of external organizations. So both two working environments are kind of similar…as …a global …or international companies. Even in design project there may not have cultural contexts at all, (because of global companies)?**
	I guess…you will be surprised a lot at little things!! It's …how to interact people…yeah….it's just little thing. I don't know. What was quite interesting is…OK…ME!! I could give you an example. Like…the way….maybe thing were evolved, but five or six years ago, 2009, when after I graduated…so basically, what I had my portfolio, I managed quite a few companies for job interviews but the thing is…never…for me…quite hard for me to get a job here? Even though I am given study here for one and half year here? But, my portfolio is basically based on what I worked in Singapore. But the thing is that, what I was interested in is that reason?...I was shocked as an Asian? Honestly, it's like problem of my portfolio because…it's not kind of my work is not good. But it tends to be…really nice aesthetic, but you don't have and put process?! So, it's like how to start A to B, so it's really nice finishing and product, which is what you are saying. That's the difference…so that is the different and…so then we…OK…we do tend to get really nice out-looking. That is our focus…is…how do we get to have nice product, notion of market or product….
	Even though we do have process, but the process is not as much as emphasized, as…you know…we don't think that over…like …comparing to here right? Process of getting performed A point to B, the documentation is very important, as important as your final? Because you have to have a reason to why do you arrive your final destination. But if you don't have process to tell you what is supporting point, than final destination, then you don't have story? So, that is the different when I first came to the UK for my job. That is the first difficulty that I faced
2	**It's quite interesting, for me, to us, because Singaporean design education system is quite advanced in general. So, there are many companies, such as foreign company when I saw your profile. You used to work for Dell…so there are many design centers in Singapore. So what make you come to the UK?**

2	I guess, like…even though Singaporean is quite advanced, our education system is quite advanced. But design history is not as richer as China or European countries nor even Korea…or japan. So in terms of when talk about design? They are very young in our country. Probably, say…product design…is probably…the top fie batch, oh no, not top five…but quite early batch…? Maybe, that's too early. But …let's see, alright ! there is our university something…have product design? Until my second year? Actually, I graduated from diploma, so that in terms of product design, it's not…we are much more slower than other countries? But we are picking out. But the thing is still same. Why do I come over step…after…as always I've always wondered about why today how do they manage all those things original ideas. Because I believe that you know…whether you are Asian or European or…we are all the same, isn't it? It's …china is creative right? Japan is also very creative? It's like different creative in different way? But how come you can come up with all those design and product? It seems to be…we are a bit more lag behind? So, that's the thing that I am curious to find out? And after the one year study you start to aware of actually they are quite different in the way of …they start…I think it stats from education. Actually I still agree with it. Do you find out it's quite different? Do you find out having a bit differences?
3	**Your countries is pretty much multi-cultural and multinational domain. And even though your education system seems to be influenced by the UK system?**
	But I mean the contents are very similar? So in terms of ….level…it's still very Asian, very Chinese, because the thing is my grandparents, my family are from China. A lot of all…Singaporean ancestors, they all come from India…China…in terms of thing that we applied, in terms of very traditional imagine. Let's imagine school! If you raise too many questions, they think of you as a trouble maker, isn't it? Let's say, Europe, if you tend to have a lot questions, they, teacher tend to think of you as a good student? You are much more engaged? That's what they said engaged? That's start off. Once you get proud of, for us, it works. Whereas we tend to everything that bossy!? That's another thing that you know is one way, hierarchy. Because you know it's like emperor. One man say something, employees do everything? And they never challenge? But over here is quite open? But I guess like …when you report…yes… you are …pretty much like you are like radio! Do you have a similar content?
	I think so! Yes it's true. And somehow, I agree with it. Actually, some of my interviewee say Singaporean education system seems very advanced? So that's why I really wanted to talk with you ?
	I guess, in order to do that, there are a lot of times, ways lose in your history? Or your cultures? A lot of time, what your education system is right? What you believe…what kind of value is…? It's different. Even though, for example, Singapore, what we had? Our education system is very similar to the UK. But our culture and value is still variation? Respect your teachers, respect your elderly, respect your boss…
4	**Kind of their mentality, their implicit mind-set is still different from here, although system seems like British?**
	So…the other thing is different, depending on who do you work? So actually I am very lucky in my first job, my boss was Dutch!, so as there as there as I say, I worked for very westernised company already! And then, my second company is like…as…I used to work for overseas company, rather than local company. So the way of culture that I've been is sort of open…set up….also…sort of the environment that…also of…like developing? It's already been started …very Westernised where you tend to speak up more than employer. Even

	though I tend to speak up more over here, sometimes I tend to be more quite. I do speak up what I do think right or wrong.
5	**It's quite interesting. Because for me, medical device design still seems to be more like engineering-based. As I had look at another case the designs product. What do you think about it?**
	OK, engineering. For us, product designers, it is that…to me, what is the good design? What is good industrial design? In order to be a good industrial designer, you can do beautiful design. What you do look outside. If you do not understand engineering, in order to have…make sure that you have watch design workable, so you have to work with engineers. So that when you do design you know what is the cost and problem? So, that is the thing that you want to think very vertical level, you don't what to think single level.
	Because, by doing think of single level, it is really hard to provide it. So that is the thing that even if you look at education, for example, Brunel. As well as I said earlier they tend to do a lot of engineering, kind of understanding. So when you do a nice design, you have to understand that, " OK, how those things fit together?" and all that, because simple design is where is the principle of hinges mechanism to make different? And how do you make them easy to produce? But yet, it looks pretty, easy to use.
	So that is the thing that you do consider. I cannot say " just this is alright!" It's not good enough. You have to say and get it is easy to use and easy to produce and without…you have to talk about all that. Then just only one thing. So there is the difference where…what I used to be from what I am doing, right now. Let's say, the thing is that…I cannot…might be quite hard to say, "That is Asia!". Because that is where I started off, that I learned where my school teach me.
	So, I could apply it to only by myself. The school teaches me, OK, at the end of my goal, it is beautiful. That is the school…10 years ago! So over the 10 years' time, right now, if you watch and go back to university, it is different. Because it is evolved. So, things that can do, can be evolved. So that's the thing that we have to understand that wen talked to people. We have to understand that you have been in that context in the time. So, because things are moving really fast. If you don't want to, taking compare things, right now? To 10 years of China or Japan, or Korea, but…because we are moving so fast, compared to right now? Compared to…so …that can…that's the thing. It's getting tricky.
	(talking about serving tea in Café for the researcher's interview)
	I guess what I am interested in is, that to understand different culture is what makes people feel comfortable. That is the first thing that I learned over the years, working in different counties.
	Because you have to understand that what is acceptable for different people, always listening with ears. That is how you try to survive in different countries.
6	**Assuming that Singaporean, Chinese, and Hong Kong whatever…are still conservative, because of Chinese culture-based. Then, what if you get a job offer as a manager? What would you like to do for them?**
6	I guess…OK. Let's back to that context. I could see that Singapore is moving in different direction. First of all, I know that Singapore is moving towards high technology, high medical devices, precisely. So that is where, good market advance…and might be good for me! I am doing medical right? Now? So that is mapping that I always give myself an opportunity. We never know what is going to happen. But there is another opportunity is opening up. The thing is that what is good for me, bring back, it s the way that we work over here. Because over here there is a lot of medical device development process? They have done it, and that for so many years. Over the experiences people that…for me, from people that experience over here, then I learned from them. That…it is …you can share with and bring back to your own country to show …or…
	Let's bring back, even if you go back to work that is where you have to work from your country. That is where you become the bridge. You are the bridge, yourself.

	You mean, the difference between Korea or Asian…and Europe in education system? Yes, it's obviously different between here and our education system. Especially, like you said. For example, approach to design, approach to thinking, isn't it? Way of thinking is still different
7	That's the reason why I came over. I think where we started off? In terms of whether our education is different? Because right in the Europe, they tend to encourage students to think, so when I was in my course, I don't want to raise up and speak up. But in our course I will see China, Korea, Japan, Taiwan, Singapore…we are all quite. But all European they all have lots of comments? Actually, what I m interested in is they are actually more creative? The… that they can develop their own idea and own talks?
	Do you feel obviously that there is something different?
8	Not, not really obviously different. It's more like…in Asia, I would say, who is the one who pay money? We have power, and then that's the one thing because they say …then we are…kind of…small(so) show more respect? More polite…? But over here in Europe, you know, you tend to be a client, but the thing that…that **..**is kind of we are " I know we are in business!" (More like partner?!) partner! You are not the one who pay me. I know you pay me, but …of course there is hierarchy, but higher level? It is more like if you do have anything, you an say so. If you don't agree, you avoid it. Rather than afraid…they are more open…I think they are more open? I couldn't say… probably say…that…maybe…let's say. It's also…it's also depending on individuals…so maybe…it's type of my stereotype?
	So, as a human bridge, you want to be a human bridge between the West and the East, and between what you learned and what you are going to work for?
9	How do you connect…because you understand that difference. You understand why people work here. Why people work back there. So you understand difference and how do you connect the bridge. How do you make things work much more smoother. Because the thing is that a lot of times, you try. Let's say, foreign company ventured in China and they went to always problem. The thing is that you need to have someone who understand two different sides, where you a sort of make it smoother. So that's the thing is that, the first thing what you can do is making the process clear. And then, from there, you can implement what you want to implement.
	Do you think if it is different between what you worked at Dell in Singapore and what you work for here? In terms of process, and in terms of context? Because it seems like still…
10	It's quite different. In the way that…let's see…it's also depending on organization. Because, different organization has different emphasis? So, basically, when I worked at Dell, we don't have like…design research? In terms of like…in terms of department focusing on that? So, we basically changed engaged…like all the European companies. So we do all the analysis program.
	So we engaged foreign consultancy, rather than we do ourselves. So over here? We tend to own research? We tend to do focus on ergonomics or we tend to do it…over…OK. So, what I could say is…in Dell has…they have…OK…it's also corporate company. So, right now, you try to compare corporate company and consultancy? So, corporate company and consultancy are quite different in the way that they function too. So, in terms of corporation, they have different departments. So they have…department of human factors? But when I worked for a previous company? They are a small consultancy, so we don't have a department for human factor. So we attempted to do it by ourselves. We tend to do more research on you own. That's quite different.

	The reason why I am asking is lot of, for example, Korean companies attempt to apply just only systems of successful companies like Apple or IDEO, without proper understanding from leasers or managers. So it couldn't be successful. But some leaders have to take a responsibility for that as a human bridge.
	No, rather mental bridge is better, human bridge seems wrong expression over here or understanding culture bridge. Culture bridge is better to what you say.
11	The other thing is language. Use of words! There are a lot of thing that I found. Because when I study in my master in St. Martin. We have a sort of course. Masters study in design study. But now, the course is change…innovative something. But, basically, we have interior design, architecture, artist, painting, product designers, marketing. So, all different types of designers are coming in, into one course. But one of the interesting things is that everyone was talking about something. But you think different works. But no one understands that each other. So that was interesting thing that they have a tendency to have argument onto the right direction because of use of different language, and different approaches. So, if…let's say, this project is for architecture, you will see that two different types of people, and two different types of approaches. So it's not talking about, in terms of cultural differences. But it is about professional approach, and professional culture, where the way of the thinking system? Is different? So, let's say, if you want to apply creating process into the organization, you have to understand that "are you talking to marketing people? Are you talking to finance guy? Are you talking to engineers? Or designers? Because, they come in different angles. The way that they think, the way that they say, and approaches are a bit different. So that is interesting thing where we call that …so…that is the thing is that, how to…word is called for moderator, you need to be a good moderator. You attempt to be a bridge?
	What is the basic attitude of designers? Because future designers for such types of product – e.g. iPhone- should understand and have broader perspectives – software, engineering, design and so on because design is getting complicated? What should designers have for those design in terms of basic attitude?
12	I think the basic is that you have to have open- mind you have to be listening, rather than sort of…because, in order for you to, because, good design, you need to understand engineering, you need to understand human factors, what is marketing department's ones? You need to understand finance ones that is, what is the company's budget? You need to understand and listen what everyone are saying. And then, that's where to start design. Because, if you design a mobile phone, marketing people say that " this is targeting…" assuming…"London, UK, I want target this for all people, for example" so, you have to design all the people.
	But then, company people say, " we don't have budget, this is for a lot of budget for product. So this is going to be cheap. Because, it's for all people, for example, even above…that…
	So, you have to understand engineering! So how do you make sure all that aspects, big consolidate into your products? so…you have to understand engineering. If you have to understand engineering, how do you make a good design in the way that package cost. so, you have to understand that, and then you work with then. So you have to speak to them with same language.
13	**Because you used to work and study in very Chinese culture value oriented Singaporean education system, and also some other interviewee say that Singaporean companies still focus on engineering, rather than designing. So, it seems big obstacles for Singaporean consultancy.**
	I guess that, because right? There is one thing that, as I said, a good designer understand engineers. So even that I go back, because I have design and engineering understanding, and knowledge. So that is not going to be problems. The thing is that why …OK..

	First thing, why do we want to work for overseas work. Not because of escaping Singapore, it is ,because, I could differentiate myself. So, let's say, if I am going back, I am able to differentiate my self. Then what I have experience is different. So, what can I bring back to contribute…so that is my perspectives. What I can contribute back, rather than if there if there is challenge is the problem. To me, it is kind of things that is good challenge is the ting that I want to make good different. So, I believe that I can make good different. Then, that's the thing is that I suppose to…I never know, I can still…depending on what kind of opportunity comes in…
14	**Most of open design or design workshop seems good. But every decision making for that is brought back to internal organization, inside your organization, although there are good design workshops between your client and consultancy? What do you think about it?**
	Because I guess, for them they do not understand us? Because you do not understand background of why do we speak up, what was the problem that we faced. So, for them, they don't see. If you are going to workshop this is how you should behave, you should voice up what you think. This is a norm to them.
	So, let's say, when local people over here, they have a workshop in Asia. They would not have kind of same result of what they expect that everyone behaves like them. But the thing is for us, we understand that they tend to…what are the reason? Who are them? Because, for example, if in this workshop, I put it the boss, everyone tend to listen what the boss says before everyone says. So the thing is that you have to understand problem with people that they are facing. And how do you create to stimulate them to speak!
	And, it is the thing that apply in the context. How do you apply in context. We don't understand where you are. Let's you say design product, because, for example, I want to design a product that straight go to India or China. And then, say this product will be everyone need to do!? Let's say, something like you have the own one – four. One- four in China means like that. If you have product design one- four, no one would buy it. So, it's same.
	If you want to do kind of brain-storming, you have to understand kind of in that context. If you don't understand that context, that would be different! So you have to apply in the rule, as more like psychological of people. So, …its what I found. I enjoy all the kind of things where you want to find out you are creative bridge. What you find out is the creative bridge.
	EG
1	**That' the interesting point. There are lots of design student who come to the UK for their education. What's the strengthen point of the UK design education?**
	It's ..that's tricky one. It's very careful I say…it' not as good as the ones put that way…took'em like old brand….it's like Bentley. It' a kind of revealed…I mean there is kind of cultural critical thinking exploration, generally, which is quite strong, but has been diluted a lot in the past few years…and place like RCA very well, because one of the thing to do is track lots of brilliant student and students push each other. And it's kind of experiment what happens, if you put lots of brilliant people in real field to sell them to do something. I am a kind of great staffs. You know. Because it's the recruitment, rather than the bunch of things, everything…placement …networks afterward. I think …that there is emerging places …build… Design education in Singapore is very good. And you know…I have to say…when it comes to getting digital service things…I mean…the…very IT literature…and I cannot…for product designers product designer can do software and nothing creating website and

1	turning around doing phone model. You know that? That is kind of holistic already there…and you know, there are big American schools that are still excellent.
	It's very interesting. It's still Anglo-Saxon countries.
	Yes, education…is totally weird thing to me.
	You also said that...critical thinking. But for me, English people are really good critical thinking
	Yes, critical thinking …and just originality. You know…it's cult of individuals. You know. At the heart of Anglo-saxon culture, you know, this country were able to back to Madagascar in 200 years (ago) …is..the…notion that …the most important entity. OK? in society, is…individual benefit. Everybody…test for anything is …"does the individual benefit? And so, that means everybody is possibly you could argue too many …is grown up challenges of organizational structure to…you know people from here have faults…
2	**For example, decision making...in terms of decision making...when you suggested very good ideas as a ...customer position...(like you said)?**
	Yes! Definitely, they (The Western) are more willingness to explore …or at least to listen? If we come up…very often…if…client will ask us…for certain things…and…very often clients sometimes give us a big brief…and then…"we will come back and say…OK…here four or five options going forward to in the brief. Here is two. This one breaks to the brief in this way. This one breaks the brief in this way. This… this… we've got reinterpreted and we believe that these are other things to do. And they were listening…whereas (laughing out) some of the other Asian companies that we were working with …we…what 's happened to this...very often we have been attention…because European marketing arms are…people who bring us in…OK? They see us as strategically important. OK? And we then get inserted into political culture where we are A. threat, OK? B…because of the position of design of the organization…we can't do our job. Because…we had…give you very good example… The same Japanese company... We were working in 3D and we were delivering…rotatable things…OK ten years ago. We could present them in that way in Europe. But before they actually accepted by the client has presentation we had to take Jpack pictures of them. Because they had 2D design process. And we didn't fit 2D design process.
3	**I think it is a bit problematic. Nowadays, digital product is not like an object, but more like a kind of an integrated object merging with software something like this...if a company like the Japanese company is doing like this in that way, probably they are getting lag behind of...**

	Yes!! They…too slowly moved out. Yes!!!basically…and the…it's very interesting. At the heart, the fast mover of other marketing led companies…there is humanity to say, "Look! We are nothing, if a consumer doesn't choose us and loves us." And when every person in business comes into work everyday all they should think about "how do we get people all over the world to love us, how do we help them better" All right? The bigger the company the more the fragment…etc. what happens you get…the view of company ...two ways of viewing the company: collection of asset and power!! All is it…team people who help other people. Ok? If you have had …that…under…the rule, good companies that have that customers service vision. It is that kind of customers vision, service vision and that pleases them. A lot of them are good marketing. And so…this is important. And it is the reason you get more of it in the Eastern economy and the Western…is…"the speed of development"!!

	OK? Back in the…if you think of way of looking at…not in terms of 'now' comparing to everybody. If you look at the GDP per capita… OK? If you look at the GDP per capita, but…then penetration of…trigger things…like dish washer, something like that…! I mean…I will give you a good example in Korea! When I grew up in Canada, OK? I was born in 1959. OK? So…and…basically, in the early 1960s when I was a kid we had a Korean post shop from a charity. Because…90% of Korean was agriculture. You know? And then…just after the war? You know? And then…I was just…it was just…like Bangladesh!! And I've never forgot when I was first time in Korea in early 90s. WOW! You know…the progress…! What it means, there has been really a time for cultural brand loyalties to evolve. I am using a same kind of soup as my grand mom us. OK? How weird is that? I can't be bother to chose soap. My mother still uses same soup. You know. You get those…a kind of …deep blurred… that…that… cultural German car engineers are really…embedded… you know…things like that. And also, market! Will take…. what you also have to see is…'technical credit culture'. And…Japan, Korea…and China to certain extend as well. Well you have incredibly intelligent rational thinking engineers.
4	It's more entire value chain and…look...!! lots of things are happening in parallel related to …manufacturing…3D printing…all economics …I think it is a bit over height. Ok? I think…still desire of consumers to delegate choice to expert partners who trust the brand. And…if you have to make too many decisions…other than buy it…it might be so complicated. So …i…I still do believe that collaboration between the East and the West are …especially, England …you know…we create tremendous opportunities for Asian companies…all of the South Eastern Asia…a sort of...like that.in the same way we work with the UK for BT, just providing as exoskeleton, and disruptive influence on business. They don't have to disrupt culture, and we don't have to go to inside completely toss upside and down. But we can accelerate it and then long run…and then it calm down to … possibly…a… I don't know. It' s hard to say…will you (Asian) force people to do it? You know…we do…we kind of a lot of work to do. I cannot talk about what we do with a kind of …innovation work…large Korean company, which I will not…name…you know…I will very carefully comment on that. But it is interesting and again…there are lots of experimentation , lots of things are happened here …but then…powers back home on the head office and…decision in head office are different. Truly …Very differently bias to the decision tier…and that…that's an issue. Because it s further from customers basically. You know… first of all you are in the head office, further you are from customer. That's actually…one of the biggest … The problem isn't so much…actually not East vs. West, but the problem is "are you customer-led? Or power-led?" And what 's happening in lots of the developing economy… And again!! It is very different. GDP per capita, Canada in 19c, ok? North America in early 20c big conglomerates…the power was in railway companies. The rail companies were ended up with…you know…keep specific home concept of …hotel…you know…trucks and everything. You are going to see same thing from Scandinavia…NOKIA! Started up making boots…so the concept of leveraging a company as an organization and money and employment culture…it respects all purposes. Yeah? It is very common. It is very difficult for those companies to evolve into position of leadership on customers' inside. Because…why does the Samsung exist? What is the Samsung's purpose?... and so…it is very very difficult to . You know. It is almost better off pushing the brand into hidden network. You know? Like Samsung inside and then have different brands tailored to different market. Because I think…as you say in the West, when people have more choices yours higher up of Maslow pyramid. Emotional factor and self expression factors become a more dominant part of your purchase decision. If I can have any refrigerators, well…in my case I trust a refrigerator invisible. You know in my kitchen they were built-in. You know… I don't want to…appliances in my kitchen. So it is just…pure vision. It s not like "woooo!!! A refrigerator there!!" so these all things mean that behaviour of factors are future of business. You know. This is one of the hardest things for the Western companies to adjust to is …in fact…just like hard for western brands to cooperate the fact…they took …Japanese ten years to learn how to make car better than them. You know…Koreans, you guys, learn even faster… you know…no…they are really excellent. You know, it s very interesting. Kia hired European, Schreye …in designer to actually…what it is? … have the courage to use…the things that designers control, which is look and behaviour for purpose. Ok? If you

don't understand why to do this, why you are doing this?, what is for? Then, that is , what 'copy' comes in. Copying is just commercial strategy. It is just…we don't know what to do with a form stuff. These guys have kidney shape grill…maybe we should try something like that because we know the kidney shape grill…because it is different data inside. What you are seeing… is very rational mind trying to make sense something that don't understand. You know? This is not East vs. West, this is technical credit culture vs. emphatic humanistic. Or …I would say behaviour culture. When I now have to define difference between engineers and industrial designers, engineers apply physics using mathematical tools to managerial risks. Industrial designers apply psychologist for use of visualisation tools to test acceptance for effective… that's how I define the modern….

5	**Back to ,large organization, it is really hard for them to be changed like this to be…all human resources**
	No, no …again. Nokia!!! Large organization have …are repositioning industrial designers as the head of experience. Because they recognize, one of the funny things about design is client is a bit faster to understand what we will be for, when we have. Clients are looking at this…their…you know…whole behavior things all things…they are looking around why can help with us, our experience? Who, him!?!? Because look and feel is to find experience. You know…NOKIA? The head of customer experience ? Apple promoting Ive? You know…to head of customer experience…there is hotel company's thing like that. There is a pattern about how can be done…and there is no doubt….you know large manufacturing companies need to be reorganized. I think they need reorganize in business level and then create right kind of demand for…ism(?)…I think they need to have…A…they need to have more clearly define missions…you know…and…and…they need to …in a way…there is a company …"fashion apparel company " in the US…a bit like VW. I think more a lot of Asian companies into…be looking at to create their own platform projects. We gonna "look" " look" Samsung …OK "we do in kitchen"…"we just wash dishes…you know…" blah…blah….maybe…you know, we set around platform for (coughing)…hardware transferability…even then…you know…we don't have to…if you got app platform, you don't need to have Samsung phone to connect to smart phone store. Well…what matters is…people designing Samsung store are connecting to people designing apps (Samsung). So, that …that's where you need someone…the …the most important thing is …someone responsible for…how …full preparation fits into modern life? In the different culture, basically. And there are the people who then say " we…need this experience and then we build …form this Lego brick…you know…"Samsung screen here…this and that…because of …all Samsung component…you can …put them together, but the customer experience a bit has own marketing channel, design…and all of that…stuff…as long as R&D…is power structure that is divorced from that market, full of people who think that no better than their market. Then, there have been always dangerous miss match. Then…you can see it in lots of organizations where…what happens is…"engineers" set the goals…so a lot of …very often the goal related to actually…interested engineers. Engineers can be the creative egos too!!!. You know, spending perfect mostly exhausting part…(why)…and customer input to that …you know, market research, numbers…no genuine insight, OK? You need to create more a sort of customer focused power structures effectively, within this organization. It's not really about design. It's actually about customer-focused "deep empathy!!"
	And ….then thinking like your big…huge global multinational is… that eliminates that. "be big thing small!" And I never forget Chinese client …said that…" I have 3000 PhD as our engineering staffs. But still nobody buy my product." It's like…that's the top of organization. That is the thing! And as long as somebody other that customer…you know…is…but it's all about …that's the problem(anything)

	Nowadays it's kind of open innovation era according to many scholars and consultant etc.
	So, product should be not like a simple object but more like a platform or more like holistic object. But many Asian companies have been developed very quickly for last decades. How do you think about Asian companies such as Samsung, which have developed quickly, can achieve a leader of open innovation?
6	I think two …are separated. Open innovation can mean many things. OK? There are lots of jargons in innovation. So meaning one for open innovation is…if you create something to share in Internet and…fine…people do that. I think that is their business. But most of companies inter monitinize IP and…if you are sitting at home, and you got free time and you want to create something to post it. Great. But, if you are company? And you figure out what you are going to do in two years and hire someone to do that? That needs to be a top secret of intelligence, right? Then, you need to be cost. So…then…there is secret and privately owned vs. open. And then…you just say…that… there is innovation around closed platform and open platform. Ok? That's different, commercial openness and technical openness. So you need to be clear about which one you mean. Assuming you mean technical…technology open…then…yeah!! It's all about …needing developers? I think that …the…I think that…the era of big heavy closed platforms …even the big open platform are…I am not sure how it is going to last? Because hunger for …you know…one size fits off…as long as you says…context to Samsung is…there is always time, OK? …when price and basic function drive market success. In those situations scale is important. So as long as scale is important that s fine!! There are also…always be the time when diversity and tailoring to the individual customers become the optimum thing. Ok? The model of company like Samsung needs to learn about it... I think Apple is already there so they are by B.OK? ….you need to look at VW group. Because they corporate platform vs. brand, better than anyone in the planet. Ok? What they do is …they know how to share ruthlessly across all the range, but same time, create brand management, so…Audi is Audi, VW is VW and Bentley is Bentley, and Kuntac is Kuntac? And…they realise that increases profitability of premium brands. And increased profitability of mass market brands , because it is even more mass market. So they can sell…you know...Audi sales are much higher margin to the VW group. OK? Until Samsung…you cannot be both …a sort of…sophisticated and everywhere. Problems that VW have is …service , for example. For…so…it is interesting to see what it goes. So, platform can be operated in many levels. Platform isn't just of scale of economy…and so…rather than sticking to jargon. OK? What you have to do is to say…how can we…maximised procurement. I can make sure that …that is very simple rule, which is…if the customer doesn't notice, it should be bought brutally on the basis of economy of scales. Ok? If the customer notice it? Then you have to be optimising customer experience. Every innovation should be combination of platform elements and customization.
	I think you clearly pointed out the vital point about the holistic design. I think for a couple of decades you probably have worked with many large clients and companies. But...when we work with large companies but still kinds of what you are saying is a bit difficult to settle down in large companies. Because large companies are quite big, but each...role of designers and role of engineers are somehow separated depending upon department.
7	Yes!! oh no!! absolutely!! organizational structures are absolutely huge barrier. Sony company is a classic example of company whose a ...(really) it's still only beginning to fix it. Ok?
	But…I mean, for example, most of the companies do software in different places to hardware. They have …defined to manage products as isolation from each other, for instance. Intel people starts designing services …and then fitting object software application back in code…advertising…into planning structure of service. Then and they create silo experiences …and then …this is you know important when you got platform in play and technology all these technology….things… and so.

	There are a lot!! I mean! ... if you are a customer you know…I get (… item) Sony VIOS laptop. But …I …classic example is if you buy a video camera and you plugged it into Sony video TV.
	You know. Everything should work!? You know? Everything should work! ditto….you …. I've got Sony sound system goes on my Sony TV. The interconnection will require someone's come out from Sony shop….ah…I now…have three remote controls….I have to push twelve buttons to turn on the TV. You know…My wife doesn't know how to turn TV on.
8	**So, what if you were the Sony head of design center what would you like to do?**
	You know, pull all of them together for whole of experience, and…review platforms…you frankly review…your overhead cost …you know… one of the reasons why companies like Sony, for example …are struggling …is that actually they got too many…too much cost in R&D in the middle…OK? I mean Acer and other people like that. Sony can…doesn't need as many engineers as it has. It could…if it looked at how Lenovo or how other people run their business, it could and should be able to effectively run around profitable lap-top business. You know…it kept Sony and recommends premium leverage all those things…but in fact, it is kind of engineering dominant and…bridge of structure. Actually, these things are "cost – sum". If you are not…you know..modern companies like VW…you know , are model of you run, kind of …engineering spaces. It's going to be brutal, efficient, numeric, sheer…you know…whatever, you run brand spaces that buy and build on the platform that is existed. So I am trying to get something like that to rebuild it…so..yes, I love for ownership, software and hardware and I will look at platform sharing, and I will look at where we are positioned to make read difference. One of the areas that Sony has failed completely is leveraging position in both computers and consumer electronics.
	But this is my idea and assumption, this is a kind of politics isn't it? Some engineers already dominate...
	Technology that was totally caught …IT has given major Eastern manufactures massive and massive problems. They boost too fast. You can't …technic-credit and rational long term vision is very difficult to implement when something pops up from San Francisco. That needs to be…completed company is …obsolete. That's one of ones where we've been lucky. Because we'd been innovation equivalent to fruitfulness. Because we do project continuously. Because we are very small, ok? We've been able to adapt how we do projects, and what we do, what we designed all that incredibly ,incredibly project. So sometimes I have to do reset where I am going to company, trying to place them on a time line like GDP per head. OK? You can go into different companies, you can place them, you know. Are they doing design in 50s, 60s,70s,80s, 90s in terms of the best practice.
9	Yes, Ok! It s kinda like…and it …it is only later on …the you come to realise how bad situation is. So, in the UK, it's so bad. The UK, they did talk about product design. And one of the problems …because industrial design hasn't been fully documented as profession. OK? Every time it gets to define it as silo, car design…fashion design…shoe design …whatever…. Some of them are very different. Fashion is very different to car design….and….if you work for Toshiba, or a brand…you know …and you are working for car company… it's very similar mission. If you are working for a fashion label, there are similarities, but it is very , very different. You know. If you are an entrepreneur doing your own thing, it is also quite different. One of the things that we've done …in British industrial design association head on is …we 've actually written and regarded proof on modern definition of industrial design. It is new neutral occupation of standards for industrial design of Britain. So the first in the world. and then we are using that to private education, we've solved criterion …and a sort of things… but it is absolutely essential to a sort of define what is constant cross-over for 30 years. And what changes of what time of…what technology…obviously …because we don't do that industrial design disappear.

	Well, that's right. There are…if your practice is not long enough there are things that are consistent in the best practice. and...fairly enough to further you are from the best practice the harder is changes....so... you know...one of the example that I' ve ever seen is...we had a terrible(!) problems back in around 10 years ago. we were working with a Japanese manufacturer, which our name was...and...we were working in 3D? we were doing brand coordination ? such as ...we were broadening by the european...so to speak...subsidiary...because Japanese design office wasn't really in the expectation of European market. then... and what we found...was ...they were...really...really stuck in 50 or early 60s in terms of their model. So this is what you get the East and the West angle...is the...what you get here in a certain places not in work... is not a bit more..courage to think from the first principle and the innovative is...a bit different even within the professional itself. Whereas within the large organizational structures very top down, and autocratic that you get in Asia....you..and also...this is ...fast track things...because it is like Korea, we need someone's design stuff. Let s have it! you know. Japan? same thing! You know? Does Toyota have soul? You know?
10	No!! there is...not...not...how is Sony doing compare to Apple? Not very well!?OK ...And and...common element is...they ...their defining design in a...not the first principle in a learned way from someone else. Oh, we got a someone else's design stuff, what s the design about? it's about beautiful object.OK! so...it...its....status about beautiful subject forever. because they don't understand why they are in the first place.
	They don't understand what the design is. they are also reluctant because of a sort of top town culture to share leadership visions. because designers are really effective... Dieter Rams Braun[i] , Raymond Loewy[ii] ...to Jonathan Ive[iii] in Apple...they all have similar kind of top level connection to direction of the organizations. And trusted...to...what is the trust is their vision of how you connect a purpose of brand of their organizations with their aspirations and...magnetic with the people... you know? And you do in a way that is achievable in the right way of technology of right of days. All the three things are changed but it s different phases....and if you were...what we found in a Japanese company was...I will give you a classic... was...designers who design a product without knowing what the buttons do, OK? This is the early 90s. OK? This is what I was. OK? In the early 90s we were a sort of separated from in the world.
	GF
1	Let's talk about American ideal liberty, freedom and individualism. I think these are core things. I think that is perhaps true in the UK, but not too strong. You know…very …very ideal individuals…at most…And my belief is... that the …you know…broadly across Asia or South East of Asia, having called…they are mostly…they are more collective identity, which is important. […] And I think this is really powerful, clearly…very effective? You know to drawn… I believe for last 20 years Korea is …maybe for last 15 years China, they have been in national belief, and although you can almost suffer now?[…] for example, Shanghai mega project is a ridiculous example. And also, very good. I just love it. Here at the same time we are just arguing here about where are train tracker? So that, the clarity of purposes everybody accept or most of people accept, which is powerful!? And once a decision is made, everybody bias into it? […] Japanese company works with pride of it as a part of Sony machine. […] Although I am a small part of that, I can still be effective and powerful for that.
2	Once British some decisions to be made, British characteristic is always almost against boss. It is difficult for me to understand or to explain why it is broadly… I mean, in the birth place of industrial revolution…British people have been put a hop in many and many years. So, you know "boss is in the wall, boss is in the wall…" when we have. So the industrial revolution people go into the factory, "boss in the wall", so that we had had the unions. In the beginning of 1960s, 70s…it is really, really powerful in the UK, awful for the economy!! […]Whereas, if you go to America, the American dream was I can be the boss one day. So they wouldn't have hatred or distrust, because all of them want to be there. And so, what you have here is…loosen strategy of agreement, until boss will say, "yes".

3	The UK…has to an embassy inside LG…because LG spend on more R&D than the UK, whole of the UK. OK. We have a nice embassy with South Korea. That's very nice, we are happy, but actually looking at driving train. We should be an embassy inside corporation […] Maybe one of these examples, you should interview with Singaporean government. I think they adopted many design facts and processes, philosophies, quite well.
4	I had worked with them ZTE, where you have been industrial design department, here, and then next door was department for software design and UI design department. But there were walls that they didn't talk each other. One of the reasons is who is in charge here, industrial director, UI director? So, it's about territory? So it's serious, because at the end of the day, it' s not what the software does is what the hardware does. What experience deliver do you want to and how is the best way to deliver them. So, in some way, hardware and software, it's the one in the same thing.
5	The UK government says…can we have your R&D center? They will go. What you mean is if we bring your own center we will give you lots of money, OK? And so I agree […] Because this is I am assuming that could be little bit cheaper than we are, "I have reasonable industrial design and visualization skills.
6	LG and Samsung…they employ thousands of designers across the world, directly, and then employ lots of different consultancy. Now…world we live ..we…deal with Samsung is interesting. Why we do work with Samsung, although they employ hundreds of designer in those space, in these region alone…What is rigour in to do these guy are out? So interesting thing to me…this is not secret. Samsung has a product innovation team, PIT, So PIT these multidisciplinary people looking for new IP, you know, in a short, three…some of designers…some of business, some of marketing, whatever…
7	It turns out we are sixth largest manufacturing economy. But there are lots of food and drink there, you know. Seriously, ready meal, whiskey across the world, so if you strip down those things, we need to talk about manufacturing, metal thing. Then, it is maybe smaller. Having said that, I went to McLaren, two weeks ago. You know, the racing car? Incredible!! This is factory. But the factory that I operated on…it's clean…you know it's not machine, it's human!. So I think that it is high valued manufacturing. I think we do something very well.[…] And the answers comes back to , again, it's cultural thing. We spent hundreds of years, British empire, which is going over here and coming back, you know, blurred, blurred and blurred. So you know, something that we practice these kinds of exchanging information.
8	Rather than say, organization I would say individuals' social level. So to certain degree, organizations are collective embodiment of culture. My understanding of thing is this is generalization [...] That's the thing which is years, Samsung had Apple. Just say as one example, which we want to be better than them! So fight, fight, fight. […] So I become world number one or God! What the hell am I supposed to do now? And it takes different mentality to say, "I don't want to be number one". Actually, number one is to buy product of doing other things. And then it is entirely different approach to how you do your business, which requires completely different approach to culture, market, innovation all of these stuff. And that's really big problem. Because actually, I would not say, innovation, I would say, vision! I think Asian companies very often don't express the vision! But I think it might have one![…] Apple was long-term thinking. It went through very very bad time, as a result of that maybe now you are it is the world. Maybe if you look over 30,40 a period, maybe it is middling!
9	We are tiny bloody island, very few people. And there is something, you know, so, empire sort of those things?! Just because of Empire, somebody decided to put the clocks, GMT, right? So all of these, we, because fundamental between here and there. And then speakers said this was here and then financial trading London, that city for many exchanging? […] I think that we've been doing international knowledge management, knowledge exchange, value exchange, longer than most people. You know, much more than structured way, which makes us almost unique capable to be accepting new things to be new things to be.

10	(They design and develop software for hardware, rather than design it for ecosystem or platform. […] Because software, or operating system should be like, a platform provide?)That's the start and then go out?! So, what can we do is determine what we look like. Rather than what we look like[…]We should be rethinking the structure. You know, when we talk about 'silo' – finance, marketing, engineering all and the value that sits between the silos, or this silo begins to expand. So when engineering becomes software. So I mean…you can take it from marketing […] What digital suggests and the evidence is about, it's about participation. We are part of this. Without it, it is nothing. And that means we are gone from positive consumer, to actually saying "OK, let's do about this!"[…] the division was…is the TV guy scarified some of budget to the mobile guy more? I don't think so. What you are going to have new is the recognition. I think everybody says, 'yes, yes, yes!' But the reality is so much territory, investment, reputation, face, all of those things involved in here, that they just need to go, to allow that this happens
11	So this afternoon, this is what we are doing. Go to meeting, this is the first meeting. You know, I can't tell you who is going to come. Big opportunity you know, really, really interesting things are, I think, was like spotted on industrial design, service, design, interaction design, you know, all of that, big plan…what I need to don this afternoon shows my graphic equaliser and volume, look like this! You know, I am kind of same based whatever, it might be volume and so on. And if they seem to be slightly match here, and maybe match plus more than that we are, more interested in than, that's interesting. So in end of the day, we can show all about case studies. We can shout as much as you want, that they are going to need to look into us; what I am thinking, "can I work with you?" you know, how does this decision to be made? I don't know? Because it changes every time! We might cater him today.
12	Samsung and LG…doesn't really matter. I think that it is interesting that they are closed. If you…you know they are closed in effect, they…their main benefit are most from open innovation, you know from ability to buy chips, ability of buying utilising operating system, ability to utilise open global value chain. So, there is great time coming from when they will be open now, what they are going to do? They are going to be closed. Is this the best you should be doing? […] Some point, Samsung would, Faxxcon would involve and they even sell. Are the…an OEM form of… many people… So…I can understand what you are saying …I would suggest…I don't see any differences between hardware and software…from IP perspectives. If…if…anything, the IP related to software is much weaker than hardware. So, I mean, look at the battle. You are going to look at the battle over hardware. I mean, maybe…actually, this is interesting. I have not got so much about this. But maybe, this closing is much response to law suit that that battle is having the battle between Samsung and Apple…blah…blah. That is obviously cost of lots of money, cost of lots of time. You know , so in future, just stock has done this and shut down and then done this.
13	And returning back to defence industry …what defence industry recognises the value of speed and openness is what move consumer industry faster than defence. So speed and openness, and I would suggest speed that comes from openness, not the other way around. We are not open because we need to be quick. We need to be quick because we are open. That's what we all need to do. And if you look at…almost all the other organization now, they are structuring themselves to say, " how do we come…ah….ah…element with innovation…value chain. So just one point…that s…Unilever…that's the biggest back industry in the world. That's global industry, international government to everything. They are all opening up. And then, it seems funny to me. These guys all doing like this.
14	But you know, Apple was long-term thinking. It went through very, very bad time. As a result of that maybe now you are it is the world. Maybe if you look over 30,40 a period, maybe it is middling! Probably not […] You can be closed. Fine, let's be closed! […] And actually, engaging in being open about things doesn't make less predictable.

15	What is this! – iPhone 5. This is the result of 300 companies across the world and two hundred components and outsourced manufacturing. And is this open? Is this…can only be open? So my question is, what… this is one of difficult to say amount of technology compressed here, and it's same as TV. So if you can do this? I believe in open way, and again. It's just about definition of open. Because there is a company called CEMEX, which is a cement company in Mexico? And they have brilliant open innovation. Things here, and complexity is less about, you know, sobering chips and battery whatever, might be. Complexity is looking at an ecosystem challenge and getting everybody put line up things going to work? So is the challenge technical? Or challenge of organization? Open innovation, you know, one thing, particularly in western, which is weakness of open innovation all consolidated led all TSB (Technical Service Bulletins) stuff…
16	So the bosses who you are talking about are maybe 50s or 60s years old. Probably, Koreans within LG, but I know a bit who work with LG. They know LG is very very well. They travelled. They are actually Koreans. Now, actually I suspect you are strongly Korean. But, you've got a bit of British air around. And how many others are like you who gone out from Korea, and then return? So actually culture that you describe today, you can find out in 2 years, just "BOOM!" Because all those you guys, once you back home, and take senior jobs, all that you want to make change. […] And then the whole culture, the whole boss, big bosses in China, big bosses in Japan, big bosses in Korea, I am generalizing, but all of them are in old school! They are almost to some degree, culture that you absolutely talking about, absolutely there! That is just going to be breaking apart!
17	HTC is interesting one, right? Because they were the darling, they were the design-led, they invested heavily, they went power on it? And they were in trouble…why were they in trouble? What have they done wrong? […] I think the first answer is to say that I don't personally think they have done much wrong. It's just been only as good as Samsung. So, and I don't have absolutely started up here because we look at the massive growth of android handset across the world! What happened to this? Samsung just takes as great share about it as the expansion of HTC? Now you could say that HTC is increasingly looking like case study of failure. […] And maybe, only the reason that they didn't do was trying to expand diversified. You know, let's say, big, big Galaxy 5 is big art. Samsung really put money into that
	JC
	Does it mean that differences can be wrong?
1	Yes. Yes. But there are the reasons why it necessarily happens. Because everything addressed is about probability, not about whether it is wrong and right. There are no right answers in this world. For instance, if a senior manager or a deputy manager go to report to a director and says," this project seems better than that." If you look at possibilities and probabilities, there are much higher probability to the director because he must have been at the company much longer than the deputy manager
2	Accordingly, when it comes to risks, Eastern Asian people tend to be risk averse, relatively. Even if achievement is little they tend to invest in little risk. For instance, in case of start-up business, there are no genuine star-up businesses at all in Korea. However, in case of the Western start-up business, there are supporting systems such as angel investment and so on, which the investment is only looking forwards to an opportunity. However, there have been no such cases in Korea yet at al.

3	For instance, in case of Korea….University in Korea, academic conference in Korea…a company, LG where I worked for...when I came to an academic conference, if there are Korean professors there we should have a very clever question. If we didn't perfectly understand what a presenter's presentation and then had a question, it would make us stupid and embarrassed. But, when I came to an academic conference in a Western country or when I studied in US for MBA degree, in lecture, for instance, if a question given were the thing that wasn't fully understood by a questioner, this doesn't necessarily mean the questioner's fault but the presenters' fault. The reason why the question comes out means that, as the American presenter think, 'well, it may not be clarified by me, so I would clarify for you.' Whereas, in Korea, this is not the case […] If in the West we have a question started with "there is a dumb question from me", but most professors tend to reply to that, "there isn't such a dumb question" […] (but, in case of Korea) If some senior managers or general managers try to speak up a bit passively, executive members would respond to, 'what such a pathetic bloke is! Back to think more!! Whereas, if executive members were wrong, that means the followers must be wrong instead…there should be lots of bias.
4	A digital product is constructed by integrating all elements. So it is not able to be achieved by only one project out of all parts of the required elements. All of the tiny elements constitute into one product as a whole by negotiating and arbitrating tiny relations of trade-off. So if one part is isolated from the others the part is meant to be an outsider […] so, in other words, for better understanding, the key word of this is 'integrated'for instance, as a display resolution become clearer in a mobile phone, this can be said the better product…If battery function is improved at twice for this, it also seems to be better…however, those projects could be accomplished separately. But if all those elements put together into one product for deployment, there are so many such failed projects…that is 'trade-off'…So it is important for them to work together and have a tea and a chat to know about the differences each other in same building…the communication should be placed in real time… otherwise it is waste time.
5	It is the interesting part. Actually, when I remind of my experience in R&D center and product planning at LG electronics, those overseas R&D centers have never been meaningful to us at all. Well if it is design research center that only deal with appearance or make-up it seems fine. But, when it comes to product function and performance those elements are never applied to overseas office's cases. A product is the one as a whole that is integrated. But it cannot be accomplished even if one part is accomplished. All parts of details constitute into one product by negotiating all minor trade-off elements. If one part is isolated the part would be just outsider even if they try to do best. In this sense, most overseas R&D centres were included in this case. It seems just a part of references. That's it. […] It is unlikely case. If it becomes a very ideal case, all offices has to be together in same time line and work together.
6	Organization structure of the Korean research development organization is becoming less complicated. When I worked at a research center, if I propose one idea, for instance, there were a PL (project lead) above me, a group leader (general manager) of him, a director of the research centre and then an executive member of the them. But currently, the structure just consists of researcher, PL and executive members […] but there is still limitation in Korean organizations… That is very negative in effect. If a project carries on and if an executive member is opposed by a following member it means that the follower would be sacked. If a PL or a researcher asks him to think more in this way, the guys are immediately fingered by the superiors. That is the culture! Fingered by the superior!
7	As they are late 30s or early 40s, they become project leaders (team leaders). Mostly, the projects are very small ones. In this case, the middle level managers, such as general managers or deputy general managers should report to an executive member. But they should be still limited within the executive members' short-term focused projects, which is only focused 4 or 5 year out.

8	Actually, it is not clear why they do act like that. But they really want to live in comfort. Well, it is rather like lazy. 'What shall I do, even if I do devote to my works with passion in this project?' Perhaps, only one rank of special promotion would be the best case, general manager?' Nevertheless, they are not really the persons who have great passion to enter the Korean companies' research centres such as Samsung or LG. In Korean companies, the general managers or the deputy managers are meant not for the persons who have passion, but such persons who are good at political game and get used to the internal politics. In this sense, there are no personnel who have 20s' creativity or entrepreneurship of Silicon Valley at all…
9	There are two reasons. Firstly, we bother to use it. People are not really keen to see the system because they might not have such craftsmanship.[…] secondly, even if I connect to the system it is very ambiguous about what I have to look at. Because in order to find some solution for my profession, I should put my effort to find some references at internet, to visit some professors and so on. But in case of an area that I have never known I have no idea about where I have to start with. So if a company pushes us to see it with particular reasons that we must see such as KPI people just click them only like reading morning new paper. That's it. […] That could not be used as dedicated research tools at all…just like morning newspaper or killing time?
10	Engineering is different from general management knowledge. Knowledge about management is not necessarily deep dive. It doesn't need to get into deep dive knowledge […] It is kind of working solution. However, this is difficult in engineering perspectives because engineering has be deep dive. So the index of level-up could be different from management knowledge.
11	Like all other R&D projects do, once a project is moved on in mass production phase after accomplishing R&D, many problems are erupted. Because on one hand, it is the reason of not enough budget,or on the other hand of lack of craftsmanship and so on…
12	But, sometimes, depending on situation, a deputy manager can be right. But a director just gives him a licking. Yeah… if a director says, "you are wrong!", it may not be wrong because in terms of probability the director has more experience so it means there is higher probability of a director side than the deputy manager's one. However, there are little respect to the differences in Korean companies
13	When it comes to a perspective of an individual, post risk management is seemingly better because net-risks come lesser (than pre-risk management). There were a few incidents that were just passed by […] so, when I was a researcher there were a few such projects that were just shown up to superiors in an initiative with little consideration of following risks. Then, if anything weren't happened it must be happy to us. There were those cases that never have any troubles…then we were just happy with it. That's all
14	I could say that from two different perspectives, a consumer's and a consultant'. When it comes to personal opinion as a consumer, comparing to five years and ten years ago, if you say innovation there have been innovation (for two Korean companies, Samsung and LG). Well, for example, if you think of when I was in LG which is ten years ago, that must be the efforts to move towards innovation. Comparing to the time, I admit that there have been efforts towards innovation. However, I still feel like that it is not enough. Whereas, apart from consumer's perspective, when it comes to a consultant's perspective, that is far away from innovation. That is my answer. […] Samsung, they have lived as a fast follower so far. But while they have claimed in the patent lawsuits they even have taken advantage of it. Right? In the meantime, it doesn't mean that Samsung has changed like Apple, but Apple was said as the major target for them to chase and defeat. So they could be motivated and threatened by Apple and Samsung could quickly move on. In other words, it is not meant for changes of Samsung as innovator, but they are still the fast follower as they have done because the most innovative company, Apple appears, which Samsung can follow. So in terms of certain criteria, recently, Samsung's sale volume is much larger than Apple. In terms of this, Samsung could be said as winner, yet it is just referred to large sales volume only. Still, it is therefore often said that in people's minds Apple is kind of the ultimate number one

15	According to one of the past Steven Jobs interviews, he said that a core capability Apple have is that amongst many capabilities they know what technology would emerge and be applied to. Well this is true and makes sense. Many R&D institutions, Samsung, LG and so on, they can make iPhone, the electrostatic touch screen and so on. It's not about what they cannot make it. But they do not bet it out of so many technologies. They cannot bet it […] although Samsung can do that in many respects, yet Samsung may not bet them. They might prefer safe play?
16	From a consultant perspectives, the answer to the question (about whether or not Samsung and LG achieve innovation)is that innovation is still far away from it […] recently, according to persons from the Samsung R&D centre and development units most development projects have been still driven by elderly Korean executive members.
17	The reason for that is that...As I know there were not changes in executive members' terms. The top management, the owners, the CEO or the vice president probably push the bottom to ask, 'why can't we do this like the competitors?!' So, they can be close to the competitors' products, yet it is not easy to overcome them. […] The reason for that is, as I believe, most development projects in Samsung or LG are still led by elderly executive members. […] They should make outstanding performances within maximum 4 years or mostly 2 and 3 years. All performances should be made within the limited period. Well, so that is to be said as limitations of them because that is not allowed them to research something with focus of long term planning to defeat other competitors […] Yet, despite little changes of such executive members' terms, the reason why innovation seemingly happens to them is, the much higher ranked personnel, owners, CEO or vice CEO say to push members, "why didn't you do this like them!?", bringing competitors' products. So the new products can become closer to the competitors' products. But it is not said that the companies can ultimately defeat the competitors with really new products.
18	The reasons why short term focused development projects sporadically happen to them is still not clear. There is even no hypothesis to explain it. Yet, according to my experience and other my colleagues who work at Samsung display and Samsung mobile division[…] the most interesting thing is that as they becomes late 30s and early 40s they are entitled to be project team leaders for small projects.[…] For me, it is very interesting that they just want to live very comfortably or even rather very lazy. They question themselves, "What shall I get from this project, even if I try my best?" That must be one rank promotion to a general manager or one year promotion? That's all! Accordingly they are not to be said the persons who really have big passion and enthusiasm to enter Samsung R&D centre. As you know, if they are entitled to be general managers or deputy general managers in Korean companies such as Samsung and LG they are not the persons who have such big passion only. Yet they are kind of persons who are used to political play and such organizational life in this way as parts of the organizations. In this context, I convince that there are any persons who have neither 20s' creativity nor Silicon Valley's entrepreneurship at all. Maybe it is provocative because they are still engineers. But, "we don't need any rewards, this project can be failed. But I would do this project all this night!" Those reactions wouldn't merely happen to them at all.
19	For instance, there was this example. Yet, this could be very minor example. When we see iPhone, there is a volume button laying the phone and this can be shutter button too. But this function was neither featured in iPhone 1 nor 2 series…So at that time, Samsung engineers suggested this and was in attempt to add this function for their Samsung Haptic Phone […] So a deputy manager who had the idea told a Samsung director if the function would be added. And then the Samsung director responded to him, "What a meaningless idea is! Why don't you do more valuable research?" So they had to turn down the project at that time.

20	Returning to the assumption about open innovation, if it is same as what I know…the definition of that is …something to do not only inside an institution only. For instance, if it is mobile phone, we can visit and meet college students in a garage in Silicon Valley or meet people in it and so on.[…] well we do so and I have done it before even when I was in a Korean company's R&D center. However, when it comes to institutional system…in corporate level there were many difficulties…because of tech side, especially tech side. As this goes on this and then it can be deployed…[…] so in terms of this, actually, those specific state of the art knowledge are mostly known by young doctorate researchers not by elderly directors who have been in a company for 20 or 30 years.[…] Then those projects that young researchers proposed should be supported with a sort of financing in organizational level…But….there are communication issues
21	The question is very difficult to answer […] as a management consultant; we ourselves have never discussed such topics (platform strategy issues). Because…well, to be frankly, in many cases of Samsung and LG, according to them, most of the development projects have been still carried out sporadically." Wow, it that good?!", then they attempt to do so, and then, "Oh, this is not the way we want." And then fix it and move on again in a bit different way. […] But most development projects have been still focused on very minor things. For instance, called 'bezel'…the rim part…or if customers tend to like glossy looks, television should give luxurious aesthetics there must be many different elements that is related to the luxurious concepts. But, they don't address, 'there are many elements of luxurious elements so glossy look and feel can be one of them'. Yet, they rather approach,' glossy look and feel must be luxurious so we should go ahead for glossy look and feel. That has been still their way. Yet, that is not the case that brings with a big picture.
JH	
1	In terms of culture, there are such patterns that personal characteristics tend to be neglected in the Eastern culture, which everyone has to be somehow similar on average.[…] in case of Japan, when I talked with Japanese colleagues, they also said so. Uniqueness is somehow not allowed. Especially, in Japanese culture there are nobody who speaks up in meeting because they haven't been educated like that. For instance, there is a bag called Randosel for Japanese primary school students like a kind of big leather bag. This is somehow necessary for all primary school students. Not to wear it?! it is not imaginable to them, said my Japanese colleagues.
2	There is a pattern of collective actions (in a Korean company). Obviously it exists. If somebody do others do but if somebody don't do, everybody tend not to do so[…] it is most significant point between the East and the West. Western is likely to be individualist but Eastern are rather collectivist. There is obviously such pattern everywhere.[…] in this company, we always have to be together with my team members even in funeral. It could be possible for myself to go alone separately there if my schedule is not fit to the time […] but all company members tend to do prefer to go together all the time
3	In the beginning of a project…in terms of process….in case of the East there seems to have structures and system…and a sort of hierarchy. Whereas, in case of American, in discussion…it is natural that …in America discussion culture is very natural….naturally…naturally…but if someone doesn't speak out they are treated as 'invisible one'…so we need to speak out anyway….well it seems very natural for them[…] in contrast, in case of the Eastern Asians…they look like pupils who just listen to teacher's lecture in a class…well…it looks like that pupils at a class are forced to raise their hands against their wills after listening what a teacher talks[…]in terms of depth of thought…the Eastern Asians tend to be more thoughtful…but they are rather not natural to express their ideas…? Because, for them it is not natural to discuss their ideas in terms of culture…however, when Americans speak out…the Asian members tend to point out and underpin what the Westerners are thinking. So…they tend to prefer to draw in-depth thought

4	In fact, education style…obviously it differs from the Western. The education style we have learnt since we were at our early age…we learned that we should not speak up during a teacher's talks…and we should listen until the teacher finishes to speak to…we should not say, 'why is this?' ' why?' why is that?'…we even don't have any conception of 'why'?' itself […] but in case of America, when I studied in the US for my design MA degree, it was really difficult for me to speak up once they speak to…We are not familiar with such culture at all…we have to speak up with 'why?' question […] And when I work for a design consultancy as an internship, all Americans speak up naturally in a kitchen…but I raised my hand for expressing my idea…but then, a manager gave a comment to me later, ' you look so shy…you may have to be more aggressive…' […] in fact, Koreans were often told that we are shy…Chinese are to some degree a bit stronger....and Japanese were also even much shier than us because they talk even less than us…
5	One thing that I obviously feel from this company is…the most differences between the Western companies and Korean one…is…there is military service system in Korea…So, I strongly feel the Korean army service culture, seriously…Well…despite design team…if seniors or superiors in management parts ask to change draft and it is wrong…then design must be revised actually. Maybe they point out something on it …and then they tell that the design is changed because of this. But, this is reality that design must be revised, if superiors think that it is wrong. This is reality. It is often happened […] It is very important how to treat superiors in this Korean company, such as quick progressing of design by fitting superior's tastes. So those persons are prioritised by superiors and then they can be in such political lines of them. Thus, design concepts are often changed because of those.
6	When I came to the head quarter, I felt like that there are a lot of people and they were doing walking a tight political line.[…] well, it is very critical. It must be reason why here is mobile division. As I heard this is more serious in this mobile division. Because a decision is not necessarily determined by a design concept. Most design is confirmed not by a head of design group but by the head of this office, that is, current CEO. So, how good the relationship with the CEO is vital…because we are human.
7	Well, what I've got sensing about it was that my colleagues who were working for Google said…Hugo Barra was scouted by them (Xiaomi) at that time, who was in charge of Android. I've heard of it at that time, so that means that the Chinese company perhaps may have prepared for it by setting a system for him because they scouted him. So I did note it […] Then once their performance looks tantalising we finally started paying attention to them…
8	Design practices must be asked in-depth study. It is required of human centred research based on social and humanity study. And then this must be employed to design outcomes. That is an appropriate design process. However, we don't have time to study. Design output must come out as quick as possible without those considerations: Design concept must be generated within a week and then it should be confirmed by the top and then make a prototype that should be the final output. […]However, there are reasons why they somehow ignore the design process. For instance, in case of America, there is no notable design at all except Apple product? […] In case of Sony designer they tend to prefer 'techy' design. For them, design must be completed with perfection of mechanic in the structure. So they said, 'What is that(the US product design)?! Is the design that has been done through design process, design research, user research something?' They said so.
9	It must be changed. In fact, I think that organization and culture should be flexible aspects. Well, actually even myself, I am not that much flexible person. So, culture might be shaped not from an individual's talent but all collective wills must be acted with the collective passions. However, this company's corporate culture might not be the one that can support the passions in reality, one of things that I feel afraid is that it is kind of culture that makes us just simple salary men.

10	What I feel embarrassed is, personally, industrial designers and product designers are different from UX designer at all, although they might have common design background. It must be studied in different ways. […] however, in this company, those product designers and industrial designer are sent to UX team because they are all same designers. I was surprised at this. […] They also feel very embarrassed because they just have to work like new members as a learning process. […] Because so far, this company has been focused on manufacturing […] so in case of hardware designers just operate 3D software tools and prototype with 3D and it is sent to engineers and then engineers make something hardware with components. Yet, in case of software, it is different story. The designers' logic is also different as they look at possibilities and opportunities in different ways […] Whereas Google is software company. They also has similar problems as they has not been hardware elements at all […] they also don't understand what hardware designers do by the way. It is not understood 100 % by software designers either.
11	As far as I know, all of designers are approximately 600 members globally…well, 600 is still too large numbers for designers. […] in recent, Google also employed a lot of designers, although they are engineering based company. They also hired a lot of product designers since the year before last year […] according to them (who is working for Google),they are just working within less than 5 members at each team. But when I said we have 500 to 600 designer s who only work for UX and industrial designers they are surprised at it.
12	Each designer should have critical minds. But the main reason why they become like normal salary men is that all of the organizational culture is top-down. So when they entered this company, they could propose lots of inspiring ideas, but maybe all of them were rejected. As time goes by in this way like 'no!' it is not necessary!' and then they become brainwashed for themselves. And they have come to having such mind, ' no…I cannot…no superiors want my ideas. This is not the taste of our lord!' Those may have been already absorbed into members' mind. […]So designers should speak out, 'No', rather than always 'Yes' to relevant groups or department…
13	Yes, we have those system, called 'Single' once mail system is turned on and there is kind of discussion board for idea sharing. I think those elements are really good in terms of system.[…] Yet, it is really nice. But it is not really utilised and applied to our working. I thought that it is really good but there is some limitation to use because of certain atmosphere
14	There are several proposals delivered by a product planning team or the relevant departments. The drafts include specific and critical points that they want to present. But, if the groups ask…well. For instance, when engineers ask something to need with their advanced technology achievement it tends to be accepted without any filtering of us. There should be critical evaluation process led by designer groups as well.
15	Products designed by small design consultancies become popular and compelling in market recently. For instance, in case of Go-Pro they create new market. Action-cam too. Before then, there was Flip-mono which looks like small camcorder, iPhone sized. They create new market continuingly in that way in the USA.
16	First of all, one thing that I can see this company seems positive is, they perceive enough about why the ecosystem (holistic) is needed. That is a very important factor. Because it is significant whether leaders and superiors perceive the inquiry. The reason for that is if we should assault our enemy and if they ask back to why they needs ecosystem it must be very frustrating. So the captain very well perceives the inquiry very well and why they have to move forward to it.
17	There are the reasons why they only focus on the short-term projects. The reasons are…well, when it comes to executive members; the rank of executive member is started from director. Director is meant for a chief of a group. But, the term of a director is too short. So, within the three years all results should be made. So they just look at 3 years or 5 years in this way. If one becomes a director, the status turns out to be a temporary contractor for a year from full time employee. They have to be evaluated in key performance index then they can be determined whether the contract is able to be extended or not. That is the system. Thus, these people turned to contractors…well, it is non-sense for them to consider about long-term planning, such as 10 years plan?! They even don't know what they are going to be one year later. Therefore, they should make

18	We have grown up with manufacturing up to now […] so designers just operate 3D rendering with ideation for that, and it is sent to engineers then they make sophisticated components for hardware. However, in case of software is totally different. So the designers should think differently as UX designers have totally different ideas from product designers. So all of the elements must be interplayed very well
19	No, absolutely not! No! I have even done it before. When I organize and host a workshop…even the meaning of a workshop to them(Korean) is totally different to them, what they have to do in a workshop, what is meant for a workshop? In fact, if we carry out a workshop participants should not come without any preparation. If we give a notification for a workshop participants should come to the workshop with at least their own thoughts about the topic because it is an open place. Yet mostly they come with any knowledge on it and they tend to talk about non-relevant story […] In Korea, it could be very difficult for a host to carry on a workshop because they don't understand what it is. A workshop should also bring out some outcome. Yet it may be very difficult for them to draw an outcome from it.[…] in case of those big meeting time mostly a director tend to dominate in talking and then general managers give a few comments on it and then it finishes! It seems like school lecture! Sometimes senior designers speak out but it is not discussion at all. When someone say this and that, then they say, "Yes, confirmative!' that's it!
20	When it comes to methodology for open ecosystem and so on, it is often recognised as short-term elements for them, rather than seen from long term perspectives. Because here this company is rolled very ungently. So I felt that it is always difficult. Short term! When I addressed a story with long term planning, they often talk to me that I have my head in the clouds!
JL	
1	I have participated in four projects for high-end digital camera development at Samsung with Japanese researchers who were belonging to Samsung Yokohama research institute. Apart from differences between the East and the West, there are significant differences even in Asian countries, Japan and Korea […] The most distinctive difference is attitudes regarding 'risk': pre-management of Japanese and post –or ongoing-management of Korean. In case of Japanese team they tried to their best to prepare to reduce all vulnerable issues that are going to be happened. Whereas Korean teams rather valued 'time' out of all values, so they undermined pre-risk management and all risks and issues were being sorted out during the projects or after the projects. Well…each approach has own pros and cons….so as the result, currently the statuses of Japanese and Korean electronics companies can be differently seen…But there should not be many persons who say that what Samsung currently performs better than Japanese companies necessarily mean that it will guarantee their positive future.
2	In NPD process, the most different thing from the Western companies is that Korean companies tend to value 'speed' […] This is caused by socio mechanism that has been inherited from the past in terms of history and culture. After the Korean War, Korea economy started off from zero-base and should do chase developed countries' economic level. That is deeply rooted from the ground.
3	In case of Korean organisations, comparing to the Western firms, rigidity of organization structure is likely to be weaker. That is because a personal relationship between member's minds is much more influential than an organization's rules. So even if a failure of a work in a project happens, which is hardly solved in the structure, it can be much possible that can be processed by only members' agreement behind of it, comparing to the Western ones. For instance, if personnel is faced with failure, working for called B project, it often happens that other personnel working for A project suddenly helps the members at B project .
JS	
1	Although people feel like that they are in trouble with tight schedules they are likely to follow the way without complaints. It must be affected by Korean organizational cultures. Despite same company, as far as I know local people who work at overseas offices are also working under Korean organizational culture. I think it must cause significant collision with the local cultures.

2	Recently, in case of this industry, IoT (internet of things) is included in this case. This is the concept that everything will be realised in internet. In past, ubiquitous was often mentioned, but it was just limited in boundary of idea. Yet, IoT would be commercialised in a few years […] To accomplish IoT all relevant components are established for networking with other products. […] for instance ARM corporation, they look forward to IoT business as their future sustainable business. ARM product will be equipped in all products for that. For instance, even in library, books will have the ARM products for the network...and so on.
3	If an idea is really intriguing that is called as namely original patent. In case of this, new area that has been never addressed before is discovered. In case of improvement patent, it is the one that is improved by the original idea. In fact, nowadays, there is no genuinely new product at all in terms of technology. Most of the product that we imagine is able to be realised to some extends with existing technology. That means it is just improved and refined from the original idea […] all of the patents are mainly considered in a criterion of gross profits of an idea because lawsuits are also considered in the gross profits of a product. For instance, with a standard of selling product how much percentage would be claimed in a suit….and so forth… well, so smaller gross profit product are unlikely to be claimed, but larger gross profit product are often targeted.
4	Once an engineer suggests an invention (new idea) , first we take a closer look at whether or not the idea was already issued by another one in currently existing patent. And then the process moves on. In case of patent issue, we take a look at this with multiple criteria. If there are no coincidences or similarities we can move on. Actually, even if there are lots of inventions it is quite hard for really-new invention to come out. So we have a look at an idea roughly because there must not be really new ideas to come out. Based on this rough evaluation, the idea can be regarded as novel one. […] Mostly, patent lawyers go over the documentation and revise it with own jargon […] There are several types of patents. If an idea is really intriguing …that is to be categorised as original patent, which pioneers new area. In case of improved patent it is referred to adapted and improved ones based on an original patent
5	This is all about salary and financial rewards to employees. Despite tight development schedules and working conditions, the rewards are not enough for us. It is problems of drawing a motivation
6	I am working at a product patent team and work for evaluation, issuing and scanning of all patents as an engineer. Because it is required of engineering and technical knowledge in the middle of it. […] all of the patents are mainly considered in a criterion of gross profits of an idea because lawsuits are also considered in the gross profits of a product. […] so, if development cost is higher in an initiative it is not a good idea at all.
7	First of all, maybe large corporations can be sustained anyway, even if open innovation era comes to. Such technology, 3D printing is perhaps suitable for small quantity batch production. Yet it has limitations for such small and medium sized companies to reach mass customization and production with it. […] In terms of semi-conductor design as fundamental components for open platform anyway, the roles of that should be expanded and increasing. For instance, even if such 3D printing technology is reliable to certain extends, semi-conductor design is not able to be accomplished by those technology, easily[…] When it comes to the expandable and scalable needs of those necessary components, semi-conductors, those roles of the products and of the companies that produce the product should increase so it is significant.
8	In explicit system level such serious conflicts between relevant groups or department have been rarely seen. However I think that the conflicts could be much serious in top level. And depending on departments in charge and their jobs the conflicts must be differently seen
JT	
1	Designers should have creative capability that comes from broader perspectives in order to solve a problem. Personally, I think that the UK has very diverse and multiple sources that enable us to embrace the broader perspectives. In respects of culture, if you go out in London, you can find that there are so many cultural elements such as museums, gallery and history…and diverse ethnicity groups, so we can have a lot of opportunities to experience the diversity and changing trend quickly. Then this tends to help us to be

2	Korean organization is likely to be more collective culture [...] In Korean organisational cultures, due to internal communication… and different understanding of service design.. it necessarily takes more time to explain about a project before kick-off project and even after agreement of commencement of the project.
3	In fact, the key decision maker as the top manager…are not likely to look at all those we prepared in detail because their tendency is …that they don't have time enough. So in fact, even if we attempt to tell this and that goes on through this process with document....Well, we need to show more prominent visualised images by simplifying all those process...that must be the main feature of Asian organizational cultures , Korea[...] managing expectation is important.
4	There may be different methodology or…approaches to design in the East and the West. But I think that it may be related to organizational cultures by industry sectors. When it comes to Korea, as I experienced multiple projects from Korean and European client, the most different things that I have experienced are that…we need time to explain who we are because we are the service design consultancy. The most important thing is managing expectation to clients, because, for instance, in case of product design project, we can see all outcomes with our naked eyes because of a product! So it is easier to communicate with it. But in case of service design, this is about explaining overall strategy…and in some sense…for example, in case of one Korean automotive company, there are people who tend to look at tangible outcomes and they tend to be familiar with it. So, for instance, even if we present our outcomes with power point file, they continuously respond back ' So what? What is outcome?'
5	But…those representative companies…such as A and B…there are huge giant companies…and in case of them, there are so many multiple departments at those two. Unlike product design that usually only contact with in-house design team, in case of service design, for us, we should work with varied departments, such as strategy team, marketing team and so forth…
6	For instance, when they(the Korean clients) outsource a service design project, the timeframe is usually given only one or two months, or maximum three months. Actually,if it is about product or graphic design it could be possible to come up with the whole outcomes within three or four months. So...for them...the period is maximum...But, in case of service design, if an adequate project takes place minimum period should take three months , research preparation...research execution and...drawing outcomes...those takes more time to do. But they think that three months for an whole project is enough
7	Assuming that there is a design brief about mobile app design for creating new customer experience. In case of the app, the app is not aimed at developing one channel for the experience. Yet that is for changing customer experience through multiple channels with the app. We should explain the concept in that way as it is the role of service design. Through this, there are a few cases that change an initiative scope.Yet this could be changed by budget and timeline. Or if it is more flexible in terms budget and timeline, the scope can be also diverse.
8	There are apparent differences. The most important things in service design are co-creation and collaboration, yet Korean clients are likely to think of it bothering.[…] But they have an obvious tendency to make a decision. For instance, when we work with senior manager level, assuming that they are in charge…in fact in the West all authority to make a decision is taken by the senior manager. However in Korean companies those senior level managers are not the status to make a decision in terms of their authority. So when we work with them and ask to have a consensus for some drawn ideas they have a tendency to feel burden to it. Secondly, like a workshop there are some cases that they have to present their own ideas. But for instance they even hesitate to present their ideas with Post-It[…] yet in fact, in case of the West this case is rarely found, but the tendency from Korean clients are relatively higher

9	Yes, if everyone reaches a consensus by being agreed by all superiors this could be helpful. For instance, if senior managers and deputy managers are involved in a co-creation action, this could work without any disruption. But, without a consensus by superiors there are some tendencies that they try disrupt ideation and generate concepts by picking up what we do. This is because their general manager cannot understand what the idea was if the general manager was not in presence at that time. Yet, if all those members agreed by seeing the process those risky troubles can be reduced as there is a back-up reason […] Yet, it is case by case. I could not generalize all those are due to the differences in the East and west. However, it is clear that there are more those tendencies being even much complicated decision making process in the Eastern based clients as well as Korean ones.
RB	
1	We require blunt, factual, honest reviews to get the product right! Western clients however can beat around the bush a lot and dance around an answer. Sometimes they will delay a decision or differ it to a superior in case they make a wrong call. This can also be difficult!
2	Eastern clients want to be better than their competitors, and they don't always know how or why. Usually adding features or requirements. Western clients tend to have the same goal but approach it from a 'better design' perspective - not simply adding complexity. It can be very tough to explain to eastern clients. I have worked with Korean and Chinese. Why simpler can be better? In their eyes, simpler is lower value.
3	The extra wow-factor always comes from being more personal with the team - even in a large company - but remaining totally professional at the same time. If you build a relationship then it helps a lot. Otherwise we would just be someone to blame if something goes wrong! Often clients (usually the smaller ones) don't actually know what they want until they see it, which results in a very long and inefficient design process. If you meet the brief and they don't like it, they will always claim that 'you didn't understand', rather than admit their brief was misleading or wrong.
4	Eastern clients will never openly 'brainstorm' in presence of their superiors. In case they are 'wrong'. This can be mitigated by separating them into different rooms to allow them to be creative. Eastern clients will also agree too many things even if they do not mean to do so - this is not very productive and very confusing for us as designers. We require blunt, factual, honest reviews to get the product right! Western clients however can beat around the bush a lot and dance around an answer. Sometimes they will delay a decision or differ it to a superior in case they make a wrong call. This can also be difficult!
5	This is almost not applicable to clients we work for as a consultancy. Companies often outsource design work because they have no in house design teams or they do not have that set of skills to do the job, therefore clients rarely have any design based culture. If they did, they would not need our services and we would not be working with them
MR	
1	**Is there something very impressive design project which is …as a designer which country, organization or company seems to be design focused country or company(successful) …everybody says that…for example.. the UK is the best design model country which is very diversity…?**
	Oh...we are very huge diversity...in the UK that is one of the UK's strategy …there is massive multi-cultural dimension of creative industry of the UK, it's very London focused and it's not true that the whole of the UK is multi-cultural...and diverse and...it's high degree of diversity in the UK if you compare to country like Norway, for example, where it's very Norwegian...it's very different .....I think that it's one of the UK's strengthen that is kind of very big melting pot of probably ... perhaps slightly geographically in the island nation ..it's kind of of Europe's stopping over between Asia and America that is halfway point influenced from all part of the world..i think perhaps that s one of reason makes it creative access

	Do you find any differences between Eastern based client and Western based clients in terms of their priorities for design?
2	Yes...I think so....but I.....I think it's a bit changing a bit...what I do find is the...the...closing a bit even now...things are becoming similar with better communication...and with kind of more spreading information ...things getting even more ...I think traditionally way of using design in Korea...pretend to do want a lot more …not...not...quality but volume ...volume is being really important and you know there is no way we could have delivered really succinct report in Korea ...it will have to be thick whereas another countries...that will be fine...just cut off of rare important parts and not have even appendix .... all the other things you got have done...that is completely difference. And...And I have done more experienced in a meeting in Japan...where we had prepared ...this... early on a relationship and theme in japan... where we prepare a lots, lots, and lots of details into it.....we've prepared three big presentations a lot of detailed explanation, none of differences we've done and one of the Japanese guy steps back to me and then we were now working with Korea now ..get the point now you know it's really different culture....I think this is massive...widely held view that is ....lump of Asia whereas everybody says lump of Europe everybody says it's not the case....countries are different across the whole of Europe...it's different. It's up to every country...because it's...it's same as Asia...I think if you want to kind of understand how to design effective you got to stop to seeing a big lumps of America, Europe and Asia...and actually it's much more specific and much better understanding each individual culture and it's understanding of more what's important to that is big different.
3	Yes there is massive differences...you know interestingly...kind of...really obvious differences wherein meeting in America a few months ago...and there were kind of people from all around the world....there were a bunch of Americans and...ummm...a bunch of Australians ...a couple of Europeans...and a few guys from Japan...and Singapore...and all the guys from America are just like casual or relax no part of anything. But all the guys from Japan there is like this ...yeah...completely different...personally I found out interesting...yeah...
	Could you conclude or describe about significant differences between your clients, between nationalities ...specifically....in relation to importance of conceptual ideas, decision-making process, and importance of role of engineering and design...? how do those differ?
4	In terms of concept....in Japan our clients tend to enjoy ...narrative around design to tell the story about where it comes from...and prominence of idea. They would be looking for one single big conceptual idea that drives the product...and the language that explains of it... I think in Korea the tendency to look for very distinctive visual approach to design. Even if it is kind of crazy thing as long as different....I think this kind of design looks visually different...In China there is probably...it might be different example when I have worked in China for a few years. It changes so fast....But I think the tendency to look for variation on things feels secure that is improved by others. But they want something different. But I think that it is changing. I think that world is changing a lot. I don't think that...I definitely don't think that I will be true.
5	**Do you have any feeling about any differences between your clients in terms of agility, in term of large corporations who deal with electronics...?**

5	I think lots of design departments all try to be agile ...sometimes they have big corporation structure holding them placed in is not getting them as far as they could...I think some...are...very ....good at...and... trying to communicate what designers are doing because businesses try to show how designers are affecting them and they are kind of manoeuvre like politicians to make that happened....that...whereas the other design department are fighting like rebels to try to stay in their goals. And then, there are some... actually just... kind of... held by corporate math. And then, it's not actually empowered to make big changed. In same way, China is probably the country at the moment that suffers from most being kind of constraints by corporate model because designers become as a bit of Adam at the end of technology... And it isn't being used in right way....And...in a sense I think that makes it difficult. There is other trying to pull different people...I mean...Japan is probably quite good at trying to get different department together. And also inexperienced clients work for that...you know... surrounding of the whole of Japan. It is a bit of sweeping statement. But people who we work there.....I think Korea is getting very....in tune...with....kind of....insight research trying to understand consumer's pattern ....you know....I think that they are heavily massive changed in Korea. In other working our clients in Korea...18 years now...I think we are really changed now...I think. They are really trying to ...actually not trying to... they are really ingenious...(Yes...they are really trying to...be the best)...You know... Look at LG and Samsung about doing that... they are above use of design now. It is very different than was years ago.
	When it comes to large corporation again, what are the most difficult constraints when you work with them in terms of electronics products?
6	I think it depends on what ways that you perceive the difficulty...Act of working with big corporation ...sounds isn't necessarily difficult. I think act of being effective is with them....It is the ways of challenging laid. Because you know...both of our clients. Our clients are ended us with what we go to take us successful in both of us interest...And ...in the....when the...businesses work with designers very much on the edge seen as marginal activity. It is very difficult for us to have effective that makes a bit different. Whereas the company where truly believe the design actually can make much different as they can help shape future direction. It can show strategy that help access to new market. That is very different. You can be much more effective. I think that kind of cultural environment which design operate....actually...that is...that is the biggest challenges getting cuturalisation, rather than actually designing something. And so for example...one of clients in China...they had...particular problem in the design in the quite edge...it was seen as very last minute edition. And the in-house design team that were given has almost no time which ...design something. And the result of that was that they copied other things. They wouldn't do anything new, because they don't have time to do anything new, because they don't have time to do anything new, and they have never had time to sit back to think about how actually they did anything , and nobody in organization believes that is important...I think that it is the most effective things that we did helped them reshape way they thought about , way they use design as cultural, which design happens...And we managed change them from having all of the pressure on the design in last minute, to actually get in them to go on to talk to boardroom, "why design was important?" "And getting it into working strategic level"... then... explore what it could do next, getting them constantly tracking what was happening, so what would be prepared for the future event when it comes to them. And then they could've act more powerful way...And then they could've acted more powerful way...And the result of that, changes was that design department had more time to do design things. Their senior team ...on board...are more open to listening design could do, and as a result of both of those things; their market grows...they sold more products...and they are becoming much more bigger. And sharing mobile division do so...they are getting that right...it's really important.
7	**When was the significant moment for them to be changed...like this way..?**

7	I said...they probably happen for a last decade...but maybe a bit longer...But I think Samsung is becoming much more interested in design how to use it,. I think they have taken advantage of design. Good.....Apple has (of course) long 'history' of design, design is everything... And the company that we worked for in Korea....Shindorico... make those ...you know they worked with really closely and have really integrated design into the future. And that really helps to take advantage of it...I think... that....
	What about poor case...when you work with...?
	Probably I would be better not name anybody else particularly... I think that poor case is ...as I said... design is in last minute things not really believed in...It starts on last minute...
	Is it ....you mean...so...China?
	Yes...!!!..I think the UK has that problem as well....I supposed...in a way... Heathrow express.... they didn't really understand design ...they didn't use it...regularly... (because of) engineering based company ...I think they realized design could help them very much better experiences for their clients...And they realized that...actually getting professionals help to get them out problem could make them...probably...then...different. And getting to point where they believe that is...you know....that makes big change....
8	**Could you tell me about the differences in terms of manufacturing even between established European countries and East, in relation to their attitude to design? Do you think the difference that you told me - Europe(the rest of countries) taking time (for ideation): emphasizing how design goes on ; East(Japan, Korea) ; a bit demanding- is this something to do with their concerns, which is about manufacturing and production line in the end?**
	No, I don't think so. It's common sense to save money in a way that they spend it. Because you generally make something and same things in a number of different ways and have it being almost identical...But one of those ways costs five times as much as others...and if you haven't experienced, not think about things in right way, you spend your client's money in a very bad way. And that's the way designer can get about name. When a designer is acting like that. That costing...that clients' money.... When you got good experience and good depth knowledge you can actually get right product and save lots of money, which increase margin...
	And again, they see something that becomes you can create something more attractive to consumers. And... Therefore you are going to get more consumers. And those consumers are willing to pay more for those product you've got three advantages from that entire money. And then you can design it in a way they reduce cost producing or rolling it, which means your margins on any prices therefore are higher. And so design is kind of work valuable sense... It is kind of ranging of perceived value of it. And the point of which...price which is willing to be paid for it, and increasing the potential size of market, and then you've got potential ...maybe money more than there...On the other hand of scale potential to make of things you produce at cheaper, but look and feel be just as good. But on the other way, design can really have significant impact on the bottom line of profitability of our client companies. But it doesn't matter which countries that clients' ones from. It's about being smart with whether you use design.
	What about large corporation's role? They probably also involve in such activities. What would be their role? I think it's still dilemmatic situation, I think... I think the difficulty of large companies is actually moving in agile way. I think those kind of...eclectic...big companies...cannot win...small businesses in agile way....often win.... Then in innovative one.... you know if you go to look into all of the… **Do you have any feeling about any differences between your clients in terms of agility, in term of large corporations who deal with electronics...?**

9	I think lots of design departments all try to be agile ...sometimes they have big corporation structure holding them placed in is not getting them as far as they could...I think some...are...very ....good at...and... trying to communicate what designers are doing because businesses try to show how designers are affecting them and they are kind of manoeuvre like politicians to make that happened....that...whereas the other design department are fighting like rebels to try to stay in their goals. And then, there are some... actually just... kind of... held by corporate math. And then, it's not actually empowered to make big changed. In same way, China is probably the country at the moment that suffers from most being kind of constraints by corporate model because designers become as a bit of Adam at the end of technology... And it isn't being used in right way....And...in a sense I think that makes it difficult. There is other trying to pull different people...I mean...Japan is probably quite good at trying to get different department together. And also inexperienced clients work for that...you know... surrounding of the whole of Japan. It is a bit of sweeping statement. But people who we work there.....I think Korea is getting very....in tune...with....kind of....insight research trying to understand consumer's pattern ....you know....I think that they are heavily massive changed in Korea. In other working our clients in Korea...18 years now...I think we are really changed now...I think. They are really trying to ...actually not trying to... they are really ingenious...(Yes...they are really trying to...be the best)...You know... Look at LG and Samsung about doing that... they are above use of design now. It is very different than was years ago.
10	**Do you think that such a degree of importance of conceptual idea is influencing decision making process as well as engineering? For example as you told me that designer should be agile and they should take long time to have certain idea for problem-solution. But conceptual idea ...actually...seems a bit intangible things for large clients, which is nothing to do with 'money' within that process. Probably manager level and top level...in their mind such process a little bit seems to be neglected. it is a bit radical example....Have you thought about such situations before once you worked with your clients?** I mean...I think at the senior level...generally. They are less interested in concept itself, and more interested in multiplying their businesses. And...I think way that it need to be communicated is around actually...how 's going to change the world in future ...of their business. Not about concept itself... it is going to do in the level...Yeah...I think it is really important that design can actually demonstrate how it could...can impact on.... **Have you ever felt about something differences between your clients about that kind of decision making? ...You told me about money issue... during the process have you ever felt about something such a concern from clients?** Yeah!! they won't spend money as little money as possible ...as much as possible from it. I think with lost of our experience...you know we try to guide that they spend money wisely. But I don't know about that kind of specific money on us. But I know just spending money on things that make it...we will try to design things in a way that delivered the highest impact at the lowest cost, and help them take advantage of the design. So they get big impact at lower cost...And I think that is about feeling way that you put something together on the way you do design feasibility. That can actually help produce that cost mainly ....seems a bit about ...kind of engineering. I think....our experience kind of ....covers ...actually...why you are going to do something to help you figure out the view...what future is this? That is wider question in business...Then moving into the world, what is it? What is going to be? And then helping them explore the world, and then helping them that about implication of different types of worlds. You take following one direction and do one thing in one business in positioning certain way.... you follow different part, and you get position in another way...And then during daunting how you are going to deliver it.

And I think that's why you kind of take advantage of designer's knowledge to construct things as best way as possible to deliver the biggest kind of quality impact and impression of best experience whether... consumer...and at the same time do in level of stripping down unnecessary cost for the company producing it.

Do you think that it is anything to do with manufacturing?
Yeah!!! It's lots of things to do with manufacturing. Recent example , two weeks ago I was in a meeting where was designing something in a specific way that they got better looking product that delivered better consumer experience...And stereotype of significant cost...and I think that the way that we approach to design of that ...see...we probably strip out more saving and service cost than entire fee. From that experience and that kind of knowledge you can actually go from...that kind of actually why should it be?, what is it? what is going to be next? How we are doing in a way that makes what we do as profitable as we can possibly be for our clients?

	Nowadays you are obviously located in London and your clients are located in many different countries and different cities. You probably communicate with certain formalized form which is documentation and computer tool…some client asks something more or something less?
11	Probably not. No....umm.. I would say ... I mean I just say that that' s just tool... just pick it up....it's just like you have to pick up phone...you have conference ....you skype somebody ..text somebody...they are just simply tool...to communicate...I think it's about the ...about the personal contact and personal communication style...if the personal is appropriate... i think that is ...whether that is business and socialization and acting in the right way...still relationship, this is important whether it is whatever it is and whatever you are...behaving in the right way is important. I don't think that doesn't necessarily mean conforming to certain set of behaviour. i think that just means making sure you are thinking about person...and...umm....expecting treating them within expecting mutual respect think mutual respect is important to in any relationship whether it s.. In you and your child, your wife, your client...you are somebody and me in bus stop. i think really important that your behaviour in a sensible and restful way to each other. I think that s true in business in different country around the world....I think as long as you got fundamental backdrop mutual respect even and communicate in any way, that s appropriate. In America working has been very blunt and very direct about something…this is going to work and this is not. I cannot say it's black and white but just for you is it just matter of business). I think it's just about way you do in style...you know.....you could not do that in japan and Korea…it will be impossible in communicate that way. but i think what you are really trying to do actually bigger and the right way to deliver a message to help somebody at the best result. i think that s why communication style becomes tangible...it's...if you don't have right style to embed in right way you cannot help somebody to get my result...that s the ultimate goal for everybody. for us and ...whether they are based in north America and south Korea people ...they all want to get the best thing as possible as they can. And I just try to find out help for them
	Do you think is that something to do with risk taking….or….?
	I think there is lots of things to do with risk taking actually....it ..is…the other point ...I think I suppose to do make point design working well.... I think it has to be seen as investment at a lot of cost... If you see as we just have spent on money, design as cost money you will not get any advantage from design. If you see design as investment you will have a very good chance that the investment will grow and grow....They help in it.
	Such a matter of money probably take place everywhere regardless of nationalities, if I conclude all your saying?
12	No....I am saying if a client does invest at expensive they should not think about cost of project...they should be thinking about return in investment that the project will deliver. For example, I work with British Airway for a couple of years...that was the first year...that was...launched... that product generated 200 million pound of return. After it that project was less than half percentage of it. If we put that context that you are spending less than half percent of 200 million pound and then you are making 200 million pound also each year. That is very very good investment. If you propose this to department…as you see...this proposal...you want million K to design that ..."so what...?" ...it's not expensive. It's not cost. This is really good investment. You spend million K on this you will have 200 million pound next year. And definitely that is why company sit back to try to make design cheaper, that it happens in last minute to try to invest less money on it, spend money on it intermittently, not continuously. That's once then they have taken advantage of how design can shape organization in ones that ready to say, "ok! we are going to continuously invest in design and innovation, trying to find better future, trying to create new product once spending one million K on the next year 200 million point in their pocket.

	When it comes to communication between clients...way of communication to share knowledge and information between clients is there any difference? Although they have....very you guys have certain tools and system, but... Is there any difference?
13	I think it' s lot of ....it is difficult to say whether daunt to say individual personal style to people rather than factors there Chinese, Japanese, America...or English. I think that's the dimension probably need to address that…we need to talk about this big ...probably historical...talking about Asian...Europe... and America...actually kind of breaking that out a bit more about action countries more interacted....that was each of country...your working for different businesses of clients ...and within each of those different departments different attitude each of those department, different individuals, different attitudes...communication styles ....changes...you know I don't think… I think japan and Korea are much more hierarchical...much more say than Europe...you know ...for example ....if you were in a meeting in japan everyone get onto speak depending on level of senioritical moment .....A senior speaks to first and ....which I think kind of of pretty much similar with Korea in another big guy express opinion before everybody else agree so them (is it common even in ...?) yes that s really common in Korea and japan....particularly in company whether they don't know you and if it's the first time I think people get to know you and start with relationship. i think hierarchy starts to mouse umm....definitely. In the beginning there is always very hierarchical question and questioning and communication...whereas, when I was worked in Holland I think it's completely opposite. junior designer you can say to the head of marketing " I am sorry, I don't agree with you, you are completely wrong". I think if you do that in LG you are probably thrown out and topple of window. It's the opposite end.
	In relation to....in terms of....do you have any idea about product platform strategy? When you work on electronics product...platform strategy and....platform is quite important. I think there might be some differences between clients to operate their platforms...Have you ever felt about some differences in terms of your client's platform strategy. ...
14	No, I don't think anything specifically to do with platform. I think all of them want to maximize advantage of platform they have....I think this is business common sense and in economic scale...I don't really have the sense...your question.....which countries brought from ...economic scale bring commercial advantage....I think...also...most countries ...would look into ...would be able to look into...would be able to open to customization things that would be as little changed as possible for the biggest benefit...again....I think....again it's not countries specific things... answers...kind of practical reality...and I guess really innovative companies they want to go on development of platform in order to create new product, or create development new product platform to derivatives.

	Could you explain about it by contrasting between impressive and incremental or derivative projects and could you tell me about the client name and the nationality?
15	Yeah....I mean ...yeah...i think that....priority is probably more variable depending upon that type of client industry sector varying ....that level of maturity of business...and the strategic direction of it and...Specific program gone...because they totally shape of some people's stand ...and I've worked on...Future of innovation thinking trying to help client decide what to do next and helping figure out what different possibilities are ..on a very strategic level ...setting different versions and help them access where it can take that business and commercial value of it and the ah....type of consumers experience we could be offering...precisely one end gone very strategic point is ..the...priority is trying to find out what to do find next...and whereas others ...what is the very tactical nature....and actually they want to do know what is the next...looks like designers are very basic...probably more in old fashion level more around hanging style something to see...

15	I think China is typically being lot of around very basic use of design (Just conventional) ...I think that is going to be changing (should be changing)....and everybody think about any make those changes...I d say...probably a lot of our working are china...and previously in Korea but probably not so much now....has been about trying to educate design department as bringing knowledge... particularly in china information and knowledge are very harder to combine. That's the very high priority...you know they cannot easily get the knowledge because the communication is more closely controlled by government with limited access to different website ....so information and knowledge becomes really and really important to them...I think knowledge and expertise is pretty vital toward company whichever part of worlds geographically is from.....and it's more case of what do you do with it ...I thought example in ...say ...say...America they will look into knowledge and expertise they help to bring something successfully to market and investment of market by addressing a number of different criteria...those criteria could be from around cost producing and cost ownership and....impact on brand and delivering time scale also massive varieties different produces. Whereas stopping China, to be bad, "we need information to try help spread out across design centres to help bring education to designers and design department." I think those are probably the most diverse
16	**Every individual can involve in probably ...theoretically ...design projects...by themselves ...and also people can customize their product which based on some certain product that they were given...so do you have some idea or insight...have you ever thought about it before?** I think this.....ah...!.....there is lot of trends around kind of trend about corporation at the moment and trying to bring everybody into the process and of creating something ...I think that lots of instances that doesn't work...umm....I don't think you are creating anything better.. I think where that kind of model is strong is actually involving people in process they feel like they have ownership within it and they think confirmative into the company to much greater level and the more understanding about overall direction. i think that that is very strong and...i think that it helps make create a kind of environment where company take a better advantage of creativity. i think that is strength. I think the problem is that at the moment that seems to be this idea way helps believe that the way you get better idea. I don't believe it is. I believe it is more expensive way than sitting with Holland people in your round, and just talking about stuff, not getting to harder and good idea. and that's...this is kind of view that if you had a workshop, it would solve all the problem, it doesn't have design workshop. It will get problem solving that everybody comes to expert designers. In the same way if you had held high-ended football workshop...kind of....many ...it is...highly...unlikely that you would ask about professional football players. At the end of that the guys are professional magnifying that the ball are kicked off at the end of the other's back of the neck.....

I think this is kind of sudden assumption that everyone is going to become a professional in design is big problem at the moment. And I think that has not been recognized why that is not enough. What I do think positive though is that is growing understanding of design, and growing interest in it, and growing involvement, that is really good. But we really have to be careful not to mix up with actually how we create something. I think you do still need different people and different specialists to create new things...perhaps designer's role is very wider looking at how we join all of the different docks, how you do understand all of different issues from many different perspectives. And then turned into pales-tic direction that create something new. Whereas specialist's research and the specialist's particular subject how they have deep knowledge about more particular things....but that isn't everything that makes it. That isn't that knowledge doesn't necessarily translate into the future of the company. But equally that designer doesn't have that kind of knowledge in certain area. But when you bring into people together we use the skills of designers to help to look at all the different skills in depth and them stitch them together to join up it in different way. And...you know....that's...when things are powerful...and I think that's corporation thing starts working.

	SW
	Have you ever found any differences between your clients and where you grew up – Taiwan – during design project?
	I think, mainly, not Taiwan, specifically, I grew up in East, which is 20 years something. But I spent time, 12years in the UK. I am a kind of half British and half Taiwanese, now? I am a kind of…most of my spending time in the UK. The thing that I can tell you about is probably a bit exaggerating experience. Someone who grow up in Asia understanding Eastern way of working…so I think I work in …now …Western company…working for this company is 4 years, now? After my PhD? I focus on many design research. I am a design researcher. I get to work on many different types of projects…quite international…from…your know…customer electronics, to graphic design types of project…also, to structural package…a sort of thing. I work on a lot of different types of project. Design researcher, normally, nobody are responsible front- end project, the project-based.
	Ok, What is main difference between your clients from the East and the West in terms of design priority?
1	In response to your first question, like I said, I am not working with the Eastern organizations. Bear in mind, I am a someone who work in the Western organization, but who grew up in the East. I think…but based on my own personal experience, priority…is…is managing client's expectation, why making sure that to produce the best, possible, the most feasible outcome for the task that we had I think this is universal, actually. In terms of our attitude toward managing project, I think what I noticed is…that...western organization is individually (inaudible) or more value. At least, this leads to more kind of creative output, at least freedom…I think that…Eastern organization…kind of from (inaudible) …Southern Eastern Asian or Eastern Asia. They are more expecting their top manager's decision making. So…the priority of employee working on the project is to provide information as much as possible for…I think project manager as a final core. But when the west organization kind …of respect individual's perspective a bit more, but the managers have to finally say … (inaudible)…they still are in hierarchical structure …during a project…they are more likely to be like…a mentor guiding a person in project onto the right part…that's kind of what I think…but I am not sure whether my…kind of… (it seems) out of date data…just a with a couple of companies I work for, a couple of project I work on…you know…more traditional Eastern organizations that 's existed…
	Could you explain about the name of Eastern organizations you worked with? Or could you explain about it?
2	No, definitely, name… I can't…confidential…because I am a consultant. We are not the…it's complex side. But, yes. I have worked with many Chinese client, as well as Korean clients…some of thing, way of management are different from how we manage our team. For example, one day, for me…my personal experience, it's kind of concept of western organization value your individual themes …capability….so…you don't have to exactly follow hierarchy like…I can talk my manager…and kind of sit equally…if you see office as well…kind of like…we all sit next to each other…you know…manager, the director, in from of my senior manager…. You know in a meeting…I could have your know…bring you know…with company CEO? You know…when I imagine…this rarely happens in Eastern organization. you know… but again, it depends on organizational culture and company culture. I think also…when the…Asian organization as well. Even though it's Asian-based organization as well…you know …even though they are Asian organization, that doesn't mean that they have Asian based approach. They might be much more open-minded maybe, more democratic…I don't think that it's by…it…by culture…is limited geographical.

3	**I will have a bit different question. Have you ever felt that there were different outcomes or unexpected ideas as results from your clients than you expected, although you help them to promote better ideas?**
	No, it's obviously not about my idea, nor this company's idea. It's not …my decision…during work for a client. It should be we…are …as consultants…we should advise for them. I think …like I said…workshop like that…in a workshop…we group people together, so group you have …some people from this company and some people from client side as well…I would say…I wouldn't say our idea…my idea…their idea….actually…so, obviously, we involve at least…stages as well…to make sure that …you know we kind of our own say…at the same time…
	One think I would more say as someone who grew up from...Asia…I think…I think there…is definitely pros…working in Asian organization…we grew up in …kind of Confucius society…so that really influence kind of way of our work …and…obviously today globalization is …design…major world is much better, but I think Asian person…we are still kind of read and breathe our traditional value…so, I think in terms of future …maybe there is difference between East and West…it will be blurred . people was …were still staying closer to traditional value that they care about…I think the East or the West…I think ..it will be very interesting …just kind of for your research working on the Eastern organization…it will be really interesting…
4	**You think that...if background of senior ,CEO, or top leader is also important, isn't it? In terms of hierarchy and decision making isn't it?**
	No! I don't think…I mean …that's not what I mean… I think…experience of senior level in manager is important. But attitude of way of …kind of create team be able to be a mentor …you know…people with your team is more important than the status…and the experience …the leader has. That's why you become a seniors because you are more experienced and then…in ideal world they will be able to be a mentor…you know…of the...less experienced team member?
5	**Now, somehow, everyone can involve in design project in terms of open design and open innovation era. So role of leader seems to become more important. But still everyone can come up with their own ideas due to open design stuff...so it seems dilemmatic situation between hierarchy and member's open participation. How do you think about this situation, as a design consultant?**
	I think difference …especially…western…like I said. We are faced with …creative workshop. There is no bad idea…you know...if someone have …come up with great idea. You can take it and you can even make it better. You don't look at, negatively "no! it's bad idea!" in terms of role of leader or top manager…I think …it…they …still in their experience they supervise to monitor and to…kind of praise the best idea out including …a…his own idea. Whether…the person like a gatekeeper…who kind of …say …turn out in from of me "no! what …sick…it's rubbish…I don't mind getting rid of them". That's not that right at all. I think you know…even more importantly…you say…role to user experience to lead project and to guide project…in a right direction…rather than to …harshly criticise to say whether this is right or this is wrong. That's not the goal of a project…the goal of project to do deliver something I expect rather than to say that you know…to create kind of hierarchical order.

6	**You pointed out very interesting point. Do you think that such a design workshop and design program is really useful and effective for you to carry out new design project before?**
	Yes! Yes! Incredibly vital…it's very useful…in a way…organization like that kind of have that kind of process. people can come together …not only people only who are within this company, not only the researchers who conduct a research, also designer who is going to design a product…also…clients coming from …different departments, when their organization…to come together …you know…obviously…for example…someone's group who has to be developing a mobile phone for past 10 to 20 years including that…her experience actual come emerged, mobile phone experience is far greater than ours. So…it's important to bridge different people together. They are expertise's…kind of…come to the…you know…creativity process…so we definitely…don't work to adopt.

Do you think that such a design workshop, design activities can influence decision making process of NPD or Service development within your client organization?
Influence…how to generate idea…based on collaborative input…obviously…there are more work after that, our process from end of workshop. You know…you have to do a lot more carry on you know…how you actually create …things your…refine your idea… our charge…you put your time something you analyse afterward. This idea need to be analysed as well. A lot of works afterwards as well…so this is very important like creative workshop…say important…in terms of process...to us…in the beginning during project.

	SW
1	In Korea, even if it is a design consultancy it was not as much liberal as the British design consultancy when I recall my previous design studio in South Korea, because the design studio should also fit to the reality of Korea business environment […] But over here (in the UK) it is actually really creative and…very creative. Even ordinary life and organizational culture itself is fundamentally underpinned by the mood…When they employ a new personnel it is always prioritised …well it was the major advantage (of the UK). Well, we are often told that the UK is very advanced in terms of creative industry? I think education itself that they have learnt at early ages differs from ours.
2	In case of Samsung and LG, they are kinds of global companies. They often work together with multiple global agencies, so those systems seem to be well established. When they present a brief, mostly it is very clear. So those projects tend to smoothly carry on[…] but in case of tangible types of design projects, which tangible outcomes come out, it tend to be the case. However, in case of strategy, there have been many cases that were changed a lot as the reporting went by in the companies, such as changing scope while they carry out it by themselves. From this point, we have got troubles each other…because that is intangible thing. They often ask framework. Even if that is not included in the initiative scope it should be included in suddenly once they need it!
3	In previous design projects, in case of mobile…consumer electronics project, we have done mostly physical appearance related mobile phone design…and television design and so on…But, currently, those project tend to be declined significantly…it is changed that those projects are not outsourced by the clients…and UX relevant project is increasing. So main teams that I had to contact has become changing year by yea… we worked with product design teams before, whereas nowadays, it is changed to work with UX…UI relevant teams for research project…and strategy project…
4	There are many reasons why Seoul office was withdrawn. The most important reason is too much operating cost to maintain the office, so it was not balanced.[…] Like us, I've seen a couple of cases that overseas offices were withdrawn due to the similar reasons a few years later.[…] Design is mostly undertaken by the head quarter in order to deal with design quality, yet marketing cost for maintaining overseas offices is much bigger than expected […] Likewise, setting overseas design offices or design centre could have shown difficult because all design outputs, from design outcomes to research, should be kept in a level of quality that is required by the head quarter. So managing those design process is actually really difficult. For instance, even in a client side when they offer outsourcing to a foreign design consultancy they have a tendency to decide it by looking at the foreign consultancy's style and quality. So, it means they even don't want Korean human resources to carry out their design project in Korea.
5	In case of a final presentation, this may be sometimes placed with top top level executive members. However, mostly it is carried out not by us directly but by mediators working at the company because there are an internal reporting system and process of a company. So it means that is passed through a certain mediating process internally. So in many cases, they tend to manipulate our deliverables and reproduce it. Well, they are the persons who know very well about how to report it internally because they are inside the company. I convince that our deliverables are distorted in the middle of those processes. It is dependent upon circumstances of a project, and what circumstances of a project are there. According to them, the degree of satisfaction of a project to them must differ.[…] That could be referred to distortion of information? I hope to find out a way to reduce such distortion.

6	Well, one thing that we noted is (in South Korea)…it is not allowed to work with only one agency at all. In terms of organization, it is mostly huge company and so all roles are distributed separately, although they say integration and integration. Reality is...that there is the unfair trading laws in terms of law system of Korea as companies are mostly huge sized large organizations. So each project cannot be carried out with one agency in consistent way with a map. Yet it works on separately like cell by cell….So in fact, it is very difficult for us to consistently carry out a project.
7	Well, since we are design consultancy, so we are sort of in liberal atmosphere. And mind itself is very open. Even if it is small idea or awful we are open to all thoughts. So that anybody can speak out and we welcome to it. So, it's ok in case of working with Western clients.[..] however, (Korean clients) they tend to be embarrassed to see this situation, if it is the first time for them. 'NO! it's not what we thought!' They try to stop and cut off to come up with ideas in the beginning.
	TK
1	**On the other hand, what do you think about their in-house designers ,for instance, Sony and….in Japanese companies ? Can they struggle to challenge those?** Yes I think so. Again, (for example) meeting culture they spend like for 8 hours for doing meeting in day time. But time for design actually starts with after 6 o'clock. Not everyone. but it s actually happening for some of them, which is just bad for designers who should be creative. When quantity matters is post industrial revolution and rapid economic growth era, stay working late may works but when quality matters, which is now, we need to carefully think about how we work.
2	**How about degree of importance of conceptual ideation process for new design between nationalities? Do you have any challenges to come up with conceptual ideas if the Japanese and Korean companies ask for more rational explanation during projects?** In term of concept design, the company is heavily focusing on the process. This is not thinking of designer. This is also carried out by design research team within a process, which is useful to get a goal. This is also useful to explain a concept to a client in presentation. (For example) The key thing, especially, for a Japanese client is to be very careful to explain about the process in a slide of presentation. This is not to be said as rational process exactly, but the presentation should be more careful to explain it in more rational way for Japanese clients But concept design itself is still rational process behind it
3	**Do you find differences between Eastern based client (organization) and western based clients (organizations) in terms of their priorities/preferences/expectation for design? (electronics companies)** Although Western-based companies also need rational explanation, in case of Japanese companies including Korean companies, they much tend to ask for much more rational explanations, comparing to Western-based companies – e.g. why design has to be done like this? Because they need to convince other people in their company e.g. A Japanese company: the personnel who is in charge of the project ,working with him, need to convince the design ideas with his boss after the design project. So for his presentation, he needs good reason to justify the design On the other hand, in western company, Firstly, in terms of culture, if the design idea is good, (e.g. aesthetic) there is no reason to choose the design behind the decision. Secondly, the personnel who is in charge of the project has more responsibility. He doesn't need to convince with any people in the organization in order to make sure if the design is good.

4	**What about presentation with Japanese clients? (Atmosphere/ attitude)** They are quiet. They don't ask question. It is our nature. In Japan culture of meeting is sharing, whereas in here (Western; the UK) the point of meeting is to make a decision. This is really different. In Japan purpose of meeting is 'share' but here purpose of meeting is 'decision making'. So the share means that you don't need to raise your opinion because that is meant you don't understand what you say. That is it.
5	**When it comes to Japanese electronic companies' product, how do you think about it in terms of being focusing on advanced technology? (Problematic?)** Yes I think so. It's just thinking behind it ….(is basic). This is old fashioned way of thinking which is technology only. But again, this is not anymore. For example, Sony, they now talk that experience is important. Now mindset is changing. But it's somehow difficult to change the internal process of the organization.
	What do you think about their product platform which can embrace other types of and other companies' products within a product platform – i.e. compatibility This is really problem and really big issue. One thing is psychological distance that they have from the rest of the world as well as physical distances that they have. Japanese market is so unique so that they will be ok not to care about other market. If you want to sell product to Japanese you should keep going on within that process. So they didn't need to talk to other people to have a sort of share platform before. But if you go to Tokyo lots of people have iPhone. So it' s to emerge now. it is also (affected by) internet, Facebook, YouTube...Japanese people that are thought as people consumers in Japan is(accessing to) ....information is not just only from television advert, but also from internet, Facebook, SNS etc. they see the TV from Samsung and TV from Sony on the same day from here. Or they see Go-Pro camera from US or Cyber-shot from Sony on the same day from the same blog. So…there is no information hierarchy anymore. So Japanese companies are obviously competing with like everyone in this planet. Therefore (it is) rare relevant to sharing platform that you say. This is (matter of) balance internally (organization)...profitability...which you make a profit more. If you have only a memory stick (for) sony camera so people buy memory stick so…people make money for it. If SD is more popular obviously people don't buy this. People don't want to buy a memory stick because people already have SD card. If you can want to use it for other computer...I am not actually an expert on this... (...) It's just balance, isn't it? For example, game industry. If you have open platform you can invite more people like app. but then Nintendo has the software for only Nintendo. so we have a really nice console you can make a good profit out of the console, which is balance ...which is bringing more money into the company....Global tendency is going toward shared platform so that Japanese companies are thinking of that. But traditionally Sony...Nintendo... Panasonic ....Nikon...they are having...used to have...still have now closed platform which is (able to be) bringing more profit now. This unfortunately creates the environment where companies don't collaborate for greater outcome which is always better for consumers.
	So…is it (having open platform) matter of profitability? This (product) is not thought of from consumer. If you think about it from consumer shared platform is much better because we(consumers) have much more choices

Why do you think if they do so, although most of the Japanese companies you mentioned have been already established in terms of financial and technology aspects historically?

It is fair for them to think about profit, (that is) first of all, (the thing is) the company in there to make a profit to keep going on (and) to spend more money for research on it. It' s OK for them to think about profit. It's fair. But problem is ....they haven't shifted their mind-set towards open platform which could make more profit as well.... Closed platform has made more cash for them and then they think that maybe open platform is more profit too but still (they are) hesitating it. Because they are conservative.

6	**As a designer how do you feel about such meeting place which is just for sharing with such clients, Korean and Japanese?**
	It used to makes me feel like wasting time because nobody ask any question. But having said that…I understand it. I don't get disappointed at it because there is feedback in right moment, for example, during a drinking place. (Feedback and sharing more information in drinking place, rather than a meeting place) this is common for Japanese (including Korean), and it seems to be almost stupid and disappointed at people who don't have any questions. But this is culture, that should be changed in some occasions.
7	**What kinds of companies have done do so...?**
	(Initial) S and L….sorts of… I think this is a kind of hierarchy things both in Korea and Japan similarly. Boss after boss and next to boss and boss again…after a project you need to explain what you are going to be done to him, him… him…(your boss). You thus need to be confident to give evidence to explain it.
8	**So, do you also think if Korean and Japanese company is more difficult to have an opportunity of open design, innovation and so on?**
	Yes, absolutely, they can do it but they will do challenge more to do so because of language and structure of organization, and power of a responsibility of each individual personnel (who is in charge of a project). And procedure and many obstacles reside. For example, in case of my friend who works for a major Japanese company and can think big he makes huge change there and the company's reacting is very well to his ideas and dream.
	If so, what make there available to change now?
	Good question. Two things... One is a sense of urgency, that is, "i have to change" , which is kind of happening(now), but not everyone. Obviously CEO thinks that they should think of it like that. But this is not necessarily for everyone. For example, ' I am ok here, I have been here for 20 years . And I am safe. That kind of attitude... in a positive sense it creates really warm and sophisticated society, which I personally really value, however, it is not really good for business… (Does it mean that still there are some of them who hesitate to be changed within a hierarchy because of hierarchy, despite hardship of market situation?) Yes, perhaps in their mind that(reluctance of changing) seems to be less-risks. The other example of this is individual effort. for example, his friend, he has worked for the company and he knows he is good and a skilled person and has a experienced network in the company. He knows he can change it. But at the same time, he doesn't mind being criticized and afraid of having annoying opinion If people like his friend in the company are growing the company can be changed.
	If so, on the other hand, What have made the company not changed and stable for a last decade?

	A lot of people says that they are still in dream of success that many Japanese company had been successful for last twenty or thirty years. another reason is that people didn't listen on how they can be failed, previously, but now more people try listen. This is change. and more global educated and experienced people are growing like his people, but it hasn't been happened in last decade. there are not people who can understand design, English and business and who can understand foreign country. They were quite rare. Those people are growing now in Japan. My personal goal is to balance this good western influenced approach with Japanese traditional value such as sharing nature, work in harmony, safe comfortable sophisticated society. And lifestyle and mentality of people towards career are different from the past. In the past if a person get a job the career in the company has lasted for entire his life. But now every circumstance is changing. No company can guarantee an individual's career at all within a company, does it?
9	**What do you think about precision driven effective Japanese companies' NPD process, which has been successful for last decades (e.g. JIT, resource management and so on)?**
	Sony, Panasonic and so on in Japan have been successful well in technology advanced market. So advanced technology has been meant advancement of the company (in terms of technology). So everyone think about which is better spec. e.g. thiner screen, bigger screen, MP3 function etc. that has been all about it. But now this is not all of it. it is matter of proposition, (consumer) experience, software, service. Now, our experience is getting more and more multiple layers, dimensions. In the past people have paid for bigger screen before. Now people pay for new experience. That's reason why Japanese company has been creative but not now. Technology is really important and Japanese well work for it to make sense by working more and longer to make 'bigger'. Now, it's more like intangible quality thinking. That's what we need to deliver to market. As a designer do you think that such phenomenon can make you feel challenging? They don't actually do this for us (the design consultancy). They know that that seems a bit silly to ask to work much harder like them. They want to see quality rather than quantity.
10	**As you conclude, what is the best organization for open innovation or open design in your mind, especially, in electronics companies?**
	It is really good for me to think of it. One thing is....Japanese companies' attitude towards, for example, this company...has been changed for a last decade. Japanese companies used to be ...using us as not so slave...but people under them even for us...we have console and TV (projects) to make variations for it within three months by coming up with WOW ideas within the period, for example....But now it is much more likely to be equal. They respect our opinion and experience which is right partnership to achieve greater. The attitude is more likely to be…"What do you think about this?", "Are we doing OK?". That's really good. Because every project in any level such as government, companies, individuals and so on partnership is really important to accept opinions. So that one definition of a good company is to be a sort of flexible and open to have a partnership. That's a kind of one aspect of it.
	Other thing on it is kind of cultural differences. In Europe, there has been more examples of really strong leaders that people work for him, for example, Steve Jobs and James Dyson. They are opinion leaders with strong visions to bring people forward. So in the Western world it is still working...strong leader and the rest of them follow him. But at least in Japan it is much difficult. It's almost like 'middle-up'. So in the Western it's more like 'top-down' structure. In Japan it's more like middle-up. Because there are many clever people in middle level, experienced, more accept to cultivate things, and more people who have management skills. "How do we make unit that they decide?" push ideas to a boss, "what do you think of this, boss?". So, every person says Apple and Dyson are good examples. But I don't want to say that that is the ideal cases for, for example, Japanese and Korean companies. That's not easy to learn because nature of culture is different. So, what we

	need to do is that is...as we talked previously... evaluation process needs to be changed. It shouldn't be cultivated by rational decision making (only). It should embrace emotional source and emotional decisions. It (the decision) can be made by middle level. Then, Japanese companies will be much, much better.
	In conclusion, if middle level person in a company can empower to change by giving their decision making power to their boss as a boss doesn't say too much things to make a decision as well as emotional decision making. Insisting change like Apple or Dyson seems very difficult. I think we need to have (own) better Asian business management model.
	UW
1	Getting access to decision makers and create awareness on executive level. In most cases department leaders are fully aware of the need to implement a holistic solution but in general the companies are not mature enough for that change. Reasons for that are different home grown solutions in different departments, no overall responsibility and budget and different interests in different department
2	Here in Germany people expect German native speakers as consultants. They just feel bad and are afraid of being misunderstood if they need to speak English. Therefor we can't send Dutch consultants to a new client even if they are very experienced. The bigger the company the smaller the language problem.
3	People in the different branches still feel as part of their "old" company and protect their IP even inside a large organization. Creating a common culture for all employees is sometimes impossible. I used to work for DaimlerChrysler four years after the merge and not one Mercedes engineer in Germany accepted any American technology, not sophisticated, no additional value, etc. Tech-Transfer went only from Mercedes to Chrysler.
	VD
	Whatever you have some idea about the Eastern and the Western organization, even just your own project, you can tell me about what you have done….so…
1	So, I think…when I worked in Sony, this was really big thing. I think what you' re doing is very…it's …I cannot understand where it comes from …it's …you know…Sony is very bog element to understand between the Western Society and the Eastern society, especially, focus on consumer development, right? But what I want to say is firstly, my experience is the way…the definition of culture is based on methodology or kind of process. I don't think that there is that much difference based on geographical difference. And…for me…I think there is a level where I had in beginning I think…there is …Asian in this way…you know…for instance, both Japan and China very aggressive and they are kind of like resource heavy, so you have people spend a lot of time to do this. There is lots of culture of duty…there…so people commit 9 o'clock in the morning and even myself staying past 12 o'clock and engineers you know…say…"I have to finish this…."and you know…work through extra hours. And they focus on people kind of pushing forward from duty aspect you know…China is also similar in that way…you know…it's kind of like …how to explain this…it's…they feel like through pushing that resources…they kind of achieve anything. We have more people on this project…you know…we have more…you know…people feel like we need to finish off and then push themselves lot more etc…etc…" we can resolve this…we can make better product…" well…I think …in the…Nokia, for instance, …in the American culture, it's very different in temrs of…you can make 7o'clock in the morning and you have meeting , you tell people how progress what you work on…how progress you working…how progress some promotion…and you off at 4o'clock
	It seems very flexible in terms of working hour?

	Yeah, the reason that I mentioned is…you know…American…Western society ….I think…we are more …I am trying to make this about geographical elements too…kind of difference between the East and the West in my experience….obviously, in terms of the West…it s very kind of 'Hedonistic' approach…like ….(inaudible)…so…when you work within…I think…it's very much about…what it is for me, what I get about…in …Japan is obviously geographically Shin-to based culture. So …you know notion of respecting…notion of trying to be considerate dutiful…so, that has kind of types of approaches. I don't know this is about …this can be helpful for you or not?!
2	**What should interaction designers or designer do for making a new product or new digital devices? Because…I think…it's kind of dilemma. Because designers want to be more like agile and more flexible? On the other hand, organization wants to be managing and controlling those designers? How can it be solved between the dilemmatic situations? How can it be solved between the dilemmatic situations and between organization and individual designer? I think it's big dilemma?**
	Yes, it is. I think problem is like …if you are like a manager, right? It's easier for you to implement one system across. So you say, "your work is something to do, your turn to do this, your turn to do something…" you just believe your boss will be looking after that…Japanese. I think that's easier…easier to have SAP system. Because I've done my job . I don't need to do it. If you think about how to organize team to structure, yeah? I will focus on and look at ownership of two impacts they have done, as opposed to what I have done my job. It's not about: I've done my job, good enough. If I make my product, I am… company rewards me and company structure is in a way that it enables to remove dependency. So who 's an engineer? Give me a guy…we are actually small team, built product, yeah? We have responsibility on it? We don't have to… company has to trust that we know the company's strategy to take it into that. But there is very difficult model because management is very high weighting concerns, very high intensity. Because as a manager, they all want to control this. Till company trust employee, I don't know it does at this moment…Depending on size of the company, if cannot move forward, right? So, I think ways to design is …is to create team and the way within the team, you need to make sure that the team has a capacity to execute. And then, we can make judgment call. You know,
	I mean you can actually…you know…what you think done that. Fundamentally, like I said to you in the beginning, I do not believe there is difference between the East and the West like …when I came to Japan, when I work for Japanese company for a long time, in the beginning, I was like "Oh I am so alien…they do think very differently…"then layer of culture and history…once you get pass that, understand it, fundamentally, people are people! So one you can say, "in America, in Western society, much more…start up and so on…much more agile, much more interesting is great, yeah? But, I would say in Japan, equally, there are lots of big company, but there are a lot of great SME. You have a Skype here? Line is very doing well in Asia. Japanese company gain really good observation from Taiwan…and Singapore as well. I would say Japanese company's culture of creating product and style…are equally great. I would not say that it is divided between two. I think fundamentally people are fundamentally people. At the moment, economic level of that society is leveled up. For example, forget that geography, I take China, for example…just Brazil…after them…India. You try to make comparisons of what the process divided into development between the North countries, America and Europe versus…and so I think that's the big element. And then…that's the reason why…I said to you geographically, it would be you are right so nice…because…those guys are over there. They do things like that. And do it…and in…Sony…they wanted to say that. This is for this, this is for this market. This would be like this. Mine wants to create formula and simplified thing. It's natural thing. But in this case, this discussion doesn't work. Because to do with like industry. To do the fact that…what economic level of that, society is…etc…etc…

	Let's back to the Sony story. Don't you have any feeling about some political issues within the organization between engineering and design dept.? Because those hardware-focused companies perhaps was already dominated by engineering dept., in terms of human resources in my assumption. Have you ever felt about it?
3	Oh…man…Sony is really funny. It's …like I said…I said super hierarchical, super…it's not like an army. You think army has general, captain, lieutenant...you sort of like machine, right? WRONG!! In Sony it's hierarchical but politics in that…based on…teams are created based on understanding and mutual respect. So I had been a project planner. I was working with…for three or four years. We really kind of work hard together. We respect each other. So then, whenever we had a different project or even non-my own area, we always say " I would like to request to 'Ra-san'. Because he trusted me because he makes sure his boss. The boss authorize me! It s then like sub-hierarchy. So I wouldn't necessarily report. I obviously report to the creative center. But within that, because of cost system-based, he would say…as a general manager, " I want that guy, looking well!" it's weird mechanism…it's not like army, where one orders like a machine; very political…very group oriented element. Ultimately, everything under one had and one house. So the reason definitely the bog component to do that…When engineering also, you know…engineering is very difficult! Especially, engineering is one thing right? A bridge engineer is a bit different. I don't know if you know about this. So…you had similar experience. But…(sigh)…a bridge engineer would be somebody who takes a kind of expert, who understands it. That he has to give engineering team to China to execute it. With him, it's fine! If they are actually doing it, they try to a kind of mitigate their mind of work to execute, so that frustration comes in. Because we try to a kind of mitigate their mind of work execution, so that frustration comes in. Because we try to make better product. And they try to kind of mitigate process for execution. So it can create lots of sometimes frustration in one way we have done it run…(The reason) why we, design center, has engineering experiences ourselves so what we do is we use…tool called unity, unity 3D is gaming engine. But it wouldn't allow very quickly to deploy this transition of this experience for 20 devices…mobile phone…and X box, whatever…When we go engineering team you would say "you can do this!!" show them what we've done…running of devices. It's very difficult for them …that…."we could do it…??!?!?" So there is element within that. I think it's always happened…in Nokia. Sony didn't have the prototype division in design. (really?!?!) yes…so very very small division, one or two…people are nothing really strong…like flash proto…something like that. Nokia has design team…technology guys who are…really…really….One guy who specialize in mathematics and virtual or…3D virtualization in organization…so like a real math genius. They also had hardware engineers who specialize in VT stock; how to connect Bluetooth etc., pison(?) hardware engineer, including 3D printer…and building and so on…components…etc…etc… So they said within design when we worked…we actually not want prototype. We actually work first veto of product. And then distribution goes up to differencing. Take all saying, that…what we try to do this, this line could be different because …localized , because this is different to build it and customize it to launch it. So that's really great working. That kind of makes sure that friction between politics of engineering team and the other work…what else is…was…managed….because sometimes…you know…engineering team sometimes…sometimes…you know…engineering team sometimes does not try to spoil your fun, right? What …this like… "you are taking , shit!! You are talking bad on that. I am going to make it!!! If I don't make it I will look bad!". They are trying to make sure "what are you talking specific?! Show me!" So you know…I think, culturally, if you understand that I think you can mitigate the rubbish. I mean obviously politically why it's organizational issue, Sony, especially engineering has money. It's very difficult. We want switcher(?) turn on budget! I don't know something like that…there was difficult. I understand that.
4	**You used to work at Sony in the UK office and work in Japan, as a foreigner. I think you supposed to be a more independent or…the office seems to be independent on HQ. But you say…it's hierarchical…could explain about it?**

4	So…structure is…overseas studios …get budget …30% local division…so Europe…Sony Europe 30% budget, other 30 % come from …creative center…creative Centre is the head design organization in Tokyo. So…design Centre is referred to…like a module of overseas…so design centers are a kind of 50:50…like half brothers. One is belonging to Tokyo? The other is belonging to local. Local divisions like…for instance…in the UK …Bravia? And also in …in the Spain, when I used to work, we also have…B2B division for Sony Video camera…etc…etc…we will get a project from them. But we need to verify with Creative Centre…because Sony process to release a product…from designer's point of view…design is always validated by four stages of level…
	One is…local? Which is (non) director? One is group? , which is …you know…Vaio art director or chief art director? Finally, head of design in GM, so they would say, "We can release this design. We are happy." This finally goes on ahead. The process of Sony, you can not release the product without that authentication. Otherwise, it' s not Sony product! So, Sony that kind of…design with brand with authentication has to be stand by the creative centre. So even though I've worked with a lot of stuff in Europe I still had to fly a lot of time to Tokyo to show my project to get final authentication.
5	**But you are now working at kind of MS overseas office in the UK. But what's the difference between working at Eastern based…no…between MS (Overseas office) or Nokia and Sony. All of those seem to be same context- i.e. overseas office?**
	Ok. Sony is very difficult. Overseas offices are almost like playful things. They are not really like satisfied business. I personally believe for Sony, one of the key strategy for growing their designers…Because in Japan
	…you obviously graduated …maybe you go to , which is very nice private …you know…Ivy league design school… and then your professor says…" OK, you go to Mitsubishi…you go to Sony…and that's your salary man life…sort of…the other is…training with …for you to go abroad. And if you succeed they will send you to overseas offices. So…for past 15 years, Sony office, all be led by Japanese senior manager and then local hired and…some of them, mixed…it's almost like training ground to A) understand culture and learn half small ability of management techniques. Then they would be successful, they will be repatriated…in a way. I mean…there is re function (?) the reason that there is requirement…to be honest, if Sony design from overseas offices are shut down, it wouldn't be much different from them. Like their purposes…are more " yes, we can deliver local information, like training, understanding…we can support local…our subsidiary like Bravia…office whatever…Vaio…but mainly we can from people…Sony…it's really important for training .Even…when we…team works…you have …When I was in Japan, I had a junior designer under me, as a teacher. It s not just like…that taking a very serious…it's not just about somebody just help me to do my product? It's about " I have to teach her, how to grow up for the first year, which start it. She can…kind of…no dependent responsibility. So she is only being there (for) learning…what I am doing…trip…understanding…while Nokia is…slightly different…Nokia had an issue …a…for designer at least…obviously a lot of stuff in China…for production…head quarter is in Finland and they need…a key …kind of segment area…but key market like the UK...to actually have… A) a marketing office, obviously…From now on…what they have found …I don't know , Nokia where they are in Espoo, very small town, and very small city…and their mind on designers is…quality designers. It's very small. It's not many designers who you can input there. Nokia had development house in the UK Farnborough. I don't know Farnborough is further outside of London. It's a little bit like Sony like Weybridge. But they accept to move to the central London (Soho) because they couldn't hire good quality designers. Because good quality designers didn't want to work in far outside. So the way that they proceeded was a lot of key structure of staff is on Finland. But the work group around 50 % are set up in London office. So…integration between London and Finland is quite heavy. Maybe some people like…maybe every other week from

	I think this seems to be matter of geographical distances between Finland and the UK, which is much closer than …(Japan) and organizational structure, which is much flatter than Japanese, as I think?
	Yes, I think that is good assumption! Nokia is a little more flatter. But ironically classification(or qualification) …so Nokia is over exaggerated(?) so… if you for instance have a senior designer in Sony, you need to spend 15 years to be quoted as a quality designer or otherwise you are very kind of…very , very early process. So a senior designer means really title, and so…and in the Nokia, a senior designer means that you just graduate from a good school. So…in terms of it it's desperate. So…Microsoft is a little bit different. Skype? I think it's very different situation. Because skype is so important for Microsoft. They need to maintain their HQ in the UK. So, predominantly everything is happening within London office, even CEO, and everybody , a lot of people from America came here. So we are still the HQ for our group. So we are very different from …feeling to say Nokia or Sony. So, Sony ….has very small office, central office has 300 designers, in the creative center. You know…while Nokia office is more split and more equally. I think altogether around 400 designers? I don't know…makes between…60:40 …something like that 60 in Finland, 40 here (UK). While majority of Skype ...in HQ in CEO. Our office is everywhere like Palo Alto…and etc……etc. office 15 or 20 people…designers.
6	**Do you think that the number of designers can influence new design project? Because those kind of platform design should be very agile. I mean…the number of designer in office. Do you think that it can or be able to affect new design?**
	Yes, it can. I think more designers can be negative impact. Obviously, I am about to start contract…you know…it s about balance and skills that we bring to…project. So what we need to do is…to have not more designers. We need to have one expert. And that expert could be in design project management or management owner? Engineering, maybe, even marketing. Where we working at the moment …we are called it as release vehicle. So you know…in agile…we have each component which we have team, it could be application, API…whatever….it is...Data…we have like steering committee, but steering that project. Because of four leaps of each section. So if we have same discussion with two or three designers, it is not possible element into it. Because I think, what you are talking about is, it's about taking and making quick and rational decision as spoke to questioning. You know…Skype has issues about…we always ask the thing we've done and review… one project goes seven months because I've done one design, and something else. So if we…we design and redesign something…redesign something, so what we need to do is we need to have kind of half people where placed in make quick and tactical and multiple decisions. I think that what kind of makes product better, that's kind …what we make educated, understanding that …you know…design ..can provide experience and technology that can make sure execute of that experience. It's like what you have been …as spoke to something else. You know. When marketing we can make sure message, practical position, and standing of that process is also…understood…so…
7	**When I had interviews with people from Samsung and LG, which is focusing on hardware in Asia? They also have same points as yours**. And again!! I disagree with Asians! And hardware is true! And Nokia has exactly has same problem!! It's also like…one of the reasons why they are better for them to do Microsoft deal…yeah? Because their own software has not so good quality. Especially, if you look at the lower range end, what called feature phone set…etc…etc…you know the whole reason why they, Microsoft, why they happened to pull out was because they couldn't be able to have more and more platform that could…they could never integrated into iPhone. You could say…"this is S4Tengine, created by ourselves, just as good as iPhone!" you know…we have animation stock, we have capability our capture all run…so they are still very much

7	hardware. They couldn't understand that element(software_ I think the reason why I disagree with Asian is…because hardware industry primarily based on Asia is…I think…in terms of costing. Like if you go back for 50s or 60s Japan was the cheapest manufacturers. Then, that moves into Taiwan and China. Japan is not that cheapest, because of controlling in effect. It has an issue. You know? Vaio? One the my project, we had to use Japanese factory they actually go out business within given project.so I wanted Chinese, because they have better infrastructure and better quality and better production. But had to use Japanese old factory because it would…actually been closed down. People would be fired. So…you know, I think interesting thing for me …was…what happens to after China. At this moment what I would say is empirical; China is like 1980's Japan. It's raised good level, and has really good factory. It's still approach based on when we were set in the beginning!! Human resources. It's cheaper in Taiwan, especially, across north…whatever…Within that aspect, you can just throw people and just get more out. I think Taiwanese… I don't know just my personal feeling. Maybe, it's just dutiful…just burn through it. Just hard work! It's not work. Do more! Not thinking better! Just do it! And the interest thing is China…and even India…become those new places become new Taiwan! Hardware moved because of hardware's dependency. It's new countries with lower wage package like BRICs countries. Because that's why Asia is being a kind of concerned, because hardware factory has cyclone pattern to move. But I don't know. That's my personal opinion.
8	**But let me give you an example. For example, MS that you work for is also a sort of IT technology company. But nowadays, such IT technology can help organization to be more flexible within their organization, in terms of communication, such as SAP, ORACLE, and so on. What do you think of it**? I think that…the systems are really bad…I don't think that useful. There is element where organization has to certain level. I think it requires certain deployment. I think SAP is good example, also HR tools!! Because maintenance what organization have more become difficult because of geo difference, there are many people, you cannot keep employment people maintained. So answer to yours that technology is very easy to say…"Oh! Now payment are on, you know…ORACLE, SAP…whatever…etc….etc….but those tools are kind of B2B…kind of not as a single solution, not as dedicate solution. For example, good company, which is amazing. I am…If you get a chance to try to find some body there, it's now…PIXAR. PIXAR has so development...to make a own tools. So they have division of engineers to make tools for animators. So one guy who specialized …" I am going to up to 2 years that makes animation for hair for natural." All investments for the technology that…lucky. There are not saying, "Oh. What kind of tool is out there or what kind of company can provide service to make all our hair animation?" don't say. I think that s one of the reason why I personally feel that systems don't work very well, very lubricant. They don't take into account what the requirement for the organization because they've been deployed as a kind of…as…a basic…firms….to make sure …you know…this will decrease cost ours because we don't have to have many staff members as afar as think value of that tool ,an half way to go…
9	**What do you think about platform you have worked on – Sony TV, Nokia IoT project, MS projects-? Because platform projects seem to have long term visionary aspects for doing so. Do you find any differences between the Eastern and the Western? For instance, for me…Sony platform…is…seems to be…**

9	Yes!! Sony platform is not fantastic platform. I think…this is my…I think…as I mentioned to you, I am an interaction designer…so interesting aspect…of…Sony is…a hardware company. Nokia…Nokia and Sony tend to operate very similar. Now when you consider that industrial design facility? When you consider that design language and brand? When you consider that color material…library? That top! top! Companies in the world. If you want an industrial product …yeah…if you got Nokia design team and Sony design team, I guarantee you get the very best. You have A-class master surface, you have the best facility for the product…now…when it comes to production… it's different world, right? And then…their approach they took to software is also be very hardware oriented. In organizational based…the project where I worked in but I started off not as a kind of…OK!! Sony makes TV, right? …now Google TV comes out. Sony, "oh my god, this is the next system, we are…Sony makes a partnership with Google, and they say "we are going to make partnership, secretly between in sizable companies. We are going to be…partner…3 years, then we are going to find own system. The owner of the project, the general manager is that hardware owner for the (inaudible). Now, software general manager report to consider the hardware general manager …so…it's to do with the fact that 'cost' things within the company , hardware –based…because tooling is obviously very expensive , you know…they are more expensive than infrastructure of the some service stuff…so, ultimately I think , financial point of view, I don't know why everything seems to be with hardware. And the other aspect is who face with…you know the organization…design was based …Sony…like 'Cost' we called it. It's native(?) model, but we don't make any profit by far to my painful time. So…when the project starts off, for instance, I have to go…and say…"who is going to pay for my time? So…Bravia goes "we've signed 5 million for this project for face what…and the budget holder will be engineering …always engineering! Because engineering has the highest cost. So when you are going to be tooling anything resource wise…(I feel) engineering full maintain …budget. It happens a group from like…CEO group …they are "OK! It's passed. It's budget for development…it's sort by engineering site. So what happens this is process to development product from more kind of centric user pointed of view, even when …like I mentioned to you…design in Sony and Nokia is...lead it…Even MS…is …I would say another good example, but problems is when the product reach maturity and deployment always issues…probably what your friends and other interviewee say…problem is that there is restrain for execution handled by engineering. That…restraints for…like …one example is…when I was in Vaio and…I was making an advertising bar launcher …and…with that …a Chinese company says…you…soft…building it and I had an argument, because within the company engineers…a bridging engineer is a Sony engineer. I would say " we want to create a library for animation…so…execution can be smooth and then more playful…" this gives a cost two to three weeks to add the project. and this was very tough discussion for me to validate. What I would like to use tools to create and invest a library is to make better. Because they wanted to…well…design tools for Photoshop now is…you know design knowledge based…now we will make it…we don't really hardly care to say what kind of product is…so, it's dutiful but also it's kind of …very…it's not about …how good you …you know …you are a part of process…it's not about how good or product is. Steve Jobs in Apple …Jonathan Ive, you will say. "you will say a designer, engineering team is bad…I am sorry, I didn't really good job, engineering is shit. It's that . it's wrong , obviously. The reason is …because it's up to…you as a designer who makes sure and you work with engineering and execute it. And …problem is ..Sony and maybe other Asian …I don't want to speak to generalize by Asian, because …my experience is only in Japan…is the….hierarchy is very…you know….one person in the head …and everybody impose to it and everybody who is doing that job. They are kind of go wrong because the person who is in head takes blame for everything. Because he is a leader. You know ?...i dint know it's seen that . It' s experience. One…you know…good experience, 'Chibachi' stepped down as a from…subsidiary CEO of …other ones…you see…traditional image of …Toyota...when they failed customers…you know…CEO…stepped down. It's not his fault!! But he tried to protect

people in below!! It's very kind of hierarchical world…while I think…in Western company. It's more less…it's more group centric…it s more like selves…one example is…you would like do one secret project …in US, you have a small team and you do it. And you bring it up to level ...and you would say " this is an amazing project!" "OK! It's great! Let's go for it!" And Google, it's exiting this. Google persons are…20% of their time to say…"do whatever they want and come up to us!" and list it. So…you know…from that sense product development is very different where people feel like that they are more responsible for their project. Because they are closer, rather than Sony and other….hardware oriented company…you can get feel like you are a part of process a little bit you kind of …" I've done Photoshop! Or I've done the 3D render…or done this…I've done that strategy like my boss questioned on strategy and then my boss goes " I don't need specialist in strategy, because my boss all take…!!" and then that could be difficult…so when tablet came to life…Sony…didn't list table into…much later…and the reason for that is …I think …everybody thought …another division is doing it! Sony Ericson …are thought…" oh, no! Vios is doing it! " Vios …" no…no…Sony Ericsson is doing it!!! " you know. Everybody presumes they are doing something… But well…

	Unfortunately, many Asian companies like Samsung and Sony make own hardware platform like Smartphone and smart TV etc…But for me, I think they seem to be like closed platform. What do you think about it?
10	I think there is ultimately legacy issue. You know…Sony is coming from…a point of view…a kind of…it was the king! You know? And then everything was closed I don't know if you know about the story: Steve Jobs based company on the founder of the Sony. When he created iPod, he came to Sony and he wanted to use Sony software, and say…"I made this product. I wanted to apply your…that network?" And Sony says…" hmmm…Steve, forget it!" things like that! So that's that Steve created iTunes. So…you know their approaches from back in the 1960s, 1970s Sony could control everything from Blue Ray …that final version. You know? Blue ray is closed system, right? It's licensing view for them. So if they make closed system, that obviously it is much more better for them to control everything, licensing…in terms of money…etc…etc…And Steve Jobs maintained that like same thing. Apple is closed system, right? So there is reason for that why they do it, in terms of creating own network. I think Sony is so confused because when Sony created the new music services, they thought multi created music service is very important and Spotify does very well. And they thought, one of the ways, Why do we create music service? It's not to be a business like music service! But also differentiated for hardware!
	The point of view is a bit different. Sony is more focusing on hardware itself?
11	That's why you can never succeed; because you know…when it says…when make service, not for cross platform, when makes make services (it's) for hardware that is limiting the market, right? While Steve Jobs…or whoever, Spotify can …I don't know…2 billions a month! But you can only have maximum 20 million, because they can only produce 20 million units! Right the elements of that, that's why hardware has a bit difficulty. They have no idea of how to execute software and how to have a strategy to enable it. Because they are still in archaic hardware world! They can never…I don't know your experiences…But like I said, Sony designers are excellent! Sony engineering is also very good in terms of TV, in terms of etc…etc…hardware is very good. In terms of the ways experiences and services to execute? Are…extremely poor! You know, technical aspects of making screen more colorful? OK! In terms of plan to integrate features and other networks are…poor…very very poor!
12	**You have done many interesting projects such as IoT, in Nokia and Sony…etc…but nowadays, a lot of discussion on open innovation in software. What do you think about open innovation between software and hardware? What do think about open innovation in hardware? Because as you said, this types of project, hardware, seems to be engaged by a lot of engineers. What do you think about it?**
	I think one of the fantastic things is that with application-based we have deployment. You know, we…like market…iOS market, for instance so…having that deployment help fundamentally for us to create innovative ideas in its applications to have deploy throughout which helps more people to get what return for them as much as quicker for them. I think if you look into start up at the moment, as you mentioned, things(IoT) or wearable …are super hot area now. It's that…area…where lots of companies like…Nokia, for instance, it's very exited with no understanding of what it means. So it's trend for …ecosystem. But I think reason meaning in it, but… where to innovative …but it's not…by apple network responds to trans…they make equal decisions based on their portfolio…to execute something. For those reasons, it's quite difficult and it's free sources through…hot…you know…innovation in that area… you know…raspberry Pi has helped and piped in …you know…it's opening up. But you know…when you compare it up with interaction design is…rather software development is…like co-application?... you know…even my tools like SDQ tools for apple and for android , that's so removed …so …still one guy tinkering and …that…you know…listen…In order for us to meet quick …it's really bad tool of what we have…you know…imagine how let me take design interface within an illustrator and… software packages…and something for industrial design. If we don't have CAD, and if we make it by hand it is slower, right? For that same reason…I think reasons…here isn't as much as open innovation…although there is quite a bit but it's not moving as fast as …because actual deployment is very very difficult…what could it make is…occurrence…of the goggles. It s 's fantastic. If you think about it…OK, I will give you an example, Even

12	if ...Nokia…they would make a small watch type thing basically …any application you have in Window, you can ping to it like Google, almost now. And the prototype we've written this is pipe and code. We had Bluetooth engineering team to integrate it into windows phone. Fundamentally, what we want to do this is, I knew that the tiny screen is higher resolution to get…you know. We can get it… you know…by going Samsung or other areas…We knew looking for this. But such a long process… you know. For me to get for a few months for sample… if I am lucky that I am existed it would be minimum 3 to 4 months, you got sign in NDA, you got a meeting …you are going to say purpose…etc…etc…you know…if we will look at e- paper, now it in process in Taiwan. I went through. Now it's like …I need to have tools to implement, to communicate …and then now I said this is ready? Now I need to speak how many units I have, how we can optimize that production…lack of this is…I think pushing that behind. When we create modules…and screens and so on are modular, right? You know…before Raspberry Pi… you know…before all those kind of elements. It's very, very difficult for you to get that level….So I think …you…That is one element!! You know… The other element is market growth!! Do you know Wi-?? , new Qualcomm chip that, that small Wi-Fi. Bluetooth is really terrible. So and then…Bluetooth, you don't understand…it's not…it's not meant to be connectivity. When you are trying to use it, now it's basically proximity. One device come closer and then does something else. Then devices sense each other. So you have any three setting and has very slow refresh rate and it's very good for them. So we have like Wi-Fi chip at same power usage, and same size as blue tooth chip. Qualcomm making new, which is on a basis for internet….Then we can start like do a lot of things. One example is…if I have a mobile phone and that chip, another chip, I can use those things another triangulate it, which was phone it to it. So if I have that phase, if I am going to point it to TV, it automatically connect TV. But in order to do that, in order to deploy it we need to talk to people from Samsung and Sony, and say "can you integrate the your chip set, please?" They are happy to do that! But like automotive and TV, they move slowly lag. There people buy TV set every ten years. TV business is slowing down anyway. You know… for them it's very difficult…to…So with hardware stuff you do need network, you do need tools. Eventually, it's too slow to respond to. I think that's the reason why it's still little bit slow, and little bit difficult. I think that the fact that we quick start –up. We have funding and VC approaches. It is opening up. It makes it easier. But, still you know, hardware start-up and software start-up…software ...always…Yes, it's not just about process, it's about dependency. Hardware has a lot of process and dependencies. But I am saying, I will give you an example. A friend of mine in Nokia, he is making zone (?)- clock. He is a hardware engineer, programmer and building the module …for the clock himself. You ordered that he need to bet 5000 pound for FCC approval (Federal Communications Commission). That makes sure that module does self fire(?). you know…every aspect of hardware, like for 5000 pound in Russia or China…I can get a good developer from extinguishing…within 3 weeks, hop it the US. He is costing ultimately higher than…because he needs to check electricity. The electric, that has to be in a process. It makes sure that's not grey market component….etc…etc…So, it just hardware does have much more dependencies. I think that it is naturally much more complicated. It doesn't allow as quick as movement…

	WH
	What do you think about concept design process for Asian companies demanding lots of concept?
1	In our opinion they used to more demand more concepts in the beginning project. More years ago, they asked for twenty and fifty concepts for it. But we keep on talking to them "we can draw concepts...but it doesn't necessarily mean that good concept. Because we always draw ...working...concepts five days a week...and then we give the best and selected best concepts ...That means five concepts mean the top five, and we have more time to develop it through it. But twenty concepts means top twenty. It means we need to still spend more time on each of them. That means less time on important one. And twenty concepts doesn't mean twenty directions. It just means twenty shapes. Now they gradually get better to understand it. Chinese and Korean companies used to ask for lots of concepts, but now it is reduced, which is really good.

2	**Do you find differences between Eastern based client (organization) and western based clients (organizations) in terms of their priorities/preferences/expectation for design? (electronics companies)** I think this is quite big (subject). This is also depending on types of clients. But what I could have learnt from it is Korean and Chinese clients are much focusing on visual differences. Well Japanese as well. Probably they might be slightly less than the rest of the countries (China and Korea). They focus on how they look and it is going to be looks different. Probably, British and USA clients are more likely… how it does work differently. Although Asian clients also say we start off "how does it change people's life" but in the end it always looks to….Ok…how does it look different. That's the main focus. But for the Western clients…they tend to…they seem to understand more about visual difference comes from deeper roots either… Because function differences so whole look changes because of that….Manufacturing of them changes and look of them change according to them.
3	**In terms of electronics product design project, do you think if such phenomenon in Asian companies, which focus on appearance and looks, seems to be problematic, because electronics product should be more concerned with many aspects beyond it, human interaction...experience and so on?** Yes I think so. They still focus on how it looks. Especially, when we do lots of mobile phone projects…that's about before 2010 at that time mobile phone was thicker than now and screen are much smaller than now. So we've got more freedom to play with shape, and so always play with shapes and also try to apply different material to it. But sometimes when we try to apply to different materials I feel like it's not necessary. It's like shape of look different. If you want to apply glass to whole mobile phone to try to get transparency it doesn't have any benefit. It just look transparent…look different (only). (making transparent with different material- glass)is ....something grab ...they just more focus on point of grabbing...something more...people's attention, rather than back to whole product...touch...something...which...I think it is somehow really good in terms of market strategy. Yes I think that is more toward marketing side, rather than...
4	**What do you think about open platform in new product development?** I think in future trend it is going to be open platform. For Apple, for example, it's all because of Steve Jobs. If you want to be a close-up …if you want to be a quite hierarchy and structure of company the top guy needs to be very vision…and need to see future very clearly and collect. And under that you can develop product that everyone loves. But that is not going to be forever. Because, someone else are less smart and get them to do it, if you don't have assistance that can provide continuously provide …new innovation. And then it is going to be challenging. For those products …if… one strong guy…they…this is… to get this ideas… to carry out idea to implement into the product under his …the visionary ideas and then you can get very successful companies …and then can get successful business…but…at once….you need to rely on systems, rather than one guy doing this
	What makes them feel risky within the layers? Probably they don't understand it…they probably didn't see that idea. Some people are not brave enough to accept it…because if you are doing what you do all the time no risk no one blame you. If it is something new once anything doesn't happen…and then people put things …that …you …I think that is everyone…everyone …human nature to avoid…risk. But…good…theme…is you need ….really (that) you need someone no understanding …to do it…

5	**Are there something high degrees of avoidance to take risk among your clients?** Yes… I think taking risks is…another theme is…that…if company culture encourages risks of forgiving people to take during the process of innovation… I actually work for Huawei they are really good in terms of innovation. Because they are forgivable…they put efforts on people's attitudes (?). If you work hard for certain project if you want to make innovation, in the end although it's not good without…but you make that try…you still good… praise from your boss…you still have good job…it's not about blame. Blame is not good. They are quite brave. They don't …they are not afraid of making a mistake. Once you make a mistake it is still good woking…that is a good way. **As a Chinese designer, is it rare case in Chine culture?** Yes it's quite rare. Huawei is quite different. A lot of companies are states hold, but Huawei is a private company. And the culture is coming from the CEO, founder…his personality…it's getting into the all company. **What about Korean and Japanese companies?** They are becoming more better. They need less concepts… They try to listen to you…what we say more. Because previously, although they still keep on seeing you need to do this way and then paying ask to say that, they tend to forget and tend to watch what they feel comfortable to do. Now…I think when they grow bigger and they are more confidence. And they more listen to what other people do and more try to do what you think … that's really good. And also, decision making process …previously they used to be …a lot of go forward and backward during stage process one. Now they just understand…and choose one…develop of it. **What makes them be confidence?** I think their market performance. They realise they make good choice. Their ways are improved. Do not have to draw twenty concepts to choose one from…

6	**Do you think if Asian companies have a tendency to more focus on 'adding- on' something than Western companies, despite same technology or function?** I think so....Yes....but it's getting better now. For example, if you look at products from Samsung and LG speakers that they produced they are quite minimal. They are just cube. I think you research topic (somehow argues) that simple shapes... you need to have very high quality manufacturing method to make looks better and nicer. If you want to make really simple flat screen glass you are better make it flat and ...without...if anything make imperfect you are going to see it very clearly. If you make waving it is easier to hide quality. I think some of our client...talked to us like that. If you make simple it is just 'shit'...sorry I think now when the manufacturing method is much better in Asian companies they start to think making simple. **What about way of their communication during projects?**

	...It quite varies...some of them are strict....quite demanding; you know what they want to do. So...they keep pick up " that is right ...that is wrong..." I like it...I don't like it... just pick it up. But some of them are quite softer so...I like something in this... give it more on that....some companies pick it up....It is not depending on companies...but depending on personality...the person who choose it...someone who drop in here even (says) I like overall ideas...if the sketch looks nice. Even draw it in nice way they just pick it up. Some of them probably have more experience. If they pick up small things) It is quit
	Do you still find some differences from the attitude of the pick it up something between the Eastern and Western based client?

7	Yes... I think...one of the things that we concern is decision making process. Because designers telephone call I like this I like that...but one good to the point they need to choose a concept built for next brand. It is really varied. Some Asian company, they tend to have group decisions. So there is no one guy who says ' we are going to this, we are going to that' In some presentation we…designers need to vote. That s going to 7 or 8 designers in this project...then they chose it together. Some project, particularly, Korean company ...head guy chose a concept. In the meeting the decision makers of the Korean company is the top guy in the meeting with us. He is the best...Because in this way he understands where does it (concept) come from...whole concept completely.....usually (the thing) that some trouble come from is normally ...when we present in a meeting the decision maker, top guy is not there. So it has been repeated again...somehow it is lost. when top guy review all the concept what he is seeing is different shape. He does not know what it is behind it. He just picks it up. Sometimes it's not necessarily.....

8	**What do you think about such situation that a top guy dominate all process?** I think it is good...The good thing about it is if there is an really experienced guy about he can see...what we talk to him, drawing pictures future...and he can use his knowledge and get together ...and then give a good decision... It's really good. Group decision ...it is like...no one want to take a responsibility...I think it' s better one person take the responsibility. I think organizing way in management wisely ...is very important.
9	**What do you think about repeating and complicated decision making process due to absence of a top guy?** It is usually once. Someone in a meeting usually report it to the top guy. Always the work is translation. If the project is important a big guy sitting in the meeting it is the best way of doing it. I think it is not going to be tiring ...It is probably feedback...
10	**What do you think about an opinion that Chinese can be next emerging country for innovation by opening new learning opportunities?** Yes, I know what you mean. They are really open to learn other people. Yes, if a boss is innovative he is going to learn from other people... But within an organization it is …it's a kind of culture things ...he is more senior than me… utmost to respect his opinion…if he can see something like this he must have some reason for him to say this….so I can only advice to him because of my knowledge. So …but he is one guy who makes a big decision…I don't think it is going to affect creativity. Because of hierarchy….for example…japan is more hierarchy …Sony ….Walkman…lots of very important things… that' true….I think that …it is stupid to keep it, culture …structure…for creativity
11	**What do you think about open design for the Asian companies asking and demanding lots of things?** Most of projects (design), that goes to commercial to achieve certain end, because you want a project to achieve certain business goal and resolve certain problems. Not.... When we think about open design it is probably more about research. It's not practice. It is not making something. If you want to make something you need to think about cost and how to make it, and you need to think about how many people and what types of people participate, which is very complicated. But, yes...open research is quite good ...very important....I think LG...or some Asian companies they are doing set up their business in Europe office. ..I think it is one of the reason why to do so(open research). Probably, on the other hand it still cannot be completely open. For example, Google is really open company. And they have so many small project groups to explore every aspect of every day life. About two or three years they closed lots of things to find out something which is not productive so they focus their resources on more potential. In the beginning they probably can open. After a certain stage you should be selective and then put your energy into more important things.

A.3. Secondary data for main study

A.3.1. Top management's profiles of the selected cases and the organization structures

Apple			
Name (age)	**Board**	**Position With the Company (Since)**	**Background (Academic and professional areas)**
Timothy Cook (53)	Executive Board	Chief Executive Officer (2011)	• Prior to CEO, he was the Chief Operating Officer at the company • 2002 - 2005: served as the Executive Vice President, Worldwide Sales and Operations ○ 2004: his responsibilities expanded to Macintosh hardware engineering. • 2000 - 2002: served as the Senior Vice President, Worldwide Operations, Sales, Service and Support. • 1998 - 2000: served as the Senior Vice President, Worldwide Operations. • **1998: Joined Apple** • Prior to Apple: the Vice President, Corporate Materials at Compaq • Prior to his work at Compaq: the Chief Operating Officer of the Reseller Division at Intelligent Electronics. • Also spent 12 years at IBM, most recently as the Director of North American Fulfillment.
Eduardo Cue (49)	Senior Management	Senior Vice President, Internet Software and Services (2011)	• 2011- present: Senior Vice President of Internet Software and Services at Apple • 1989: joined the company ○ **Held various positions at Apple, including the Vice President of Internet Services and the Senior Director of iTunes Operations**.
Craig Federighi (44)	Senior Management	Senior Vice President, Software Engineering (2012)	• 2012 – present: the Senior Vice President of Software Engineering at Apple • 2009: re-joined Apple **Prior to re-joining Apple, held several positions at Ariba, including the Chief Technology Officer and the Vice President of Internet Services.** • **Prior to Ariba, worked at NeXT and at Apple upon the acquisition of NeXT.** • **Also, served as the Vice President of Mac OS Engineering and as the Director of Engineering at Apple.**
Jonathan Ive	Senior Management	Senior Vice President, Design	• **Unknown- present: serves as the Senior Vice President of Design at Apple** • Also leads the Human Interface (HI) software teams across the company. • Holds a Bachelor of Arts and an Honorary Doctorate from Newcastle Polytechnic.
Daniel Riccio (51)	Senior Management	Senior Vice President, Hardware Engineering (2012)	• 2012- present : the Senior Vice President of Hardware Engineering at Apple • **2010: became the Vice President of iPad Hardware Engineering 1998: joined Apple as the Vice President of Product Design and in 2010. Prior to Apple, worked at Compaq Computer as the Senior Manager of Mechanical Engineering.** • Holds a Bachelor's degree in Mechanical Engineering from the University of Massachusetts Amherst.
Philip W. Schiller (53)	Senior Management	Senior Vice President, Worldwide Marketing (2002)	• 2002- present: has been the Senior Vice President of Worldwide Marketing at Apple • 1997: Re-joined Apple • **1995- 1997: was the Vice President of Product Marketing at Macromedia** **1993 - 1995: served as the Director of Product Marketing at FirePower Systems** • Prior to FirePower: spent six years at Apple in various marketing positions.
Angela Ahrendts		Senior Vice President, Retail and Online Stores (2013)	• 2013- present: served as the Senior Vice President of Retail and Online Stores at Apple • **Prior to Apple: served as the Chief Executive Office Burberry** • **Prior to Burberry: served as an Executive Vice President at Liz Claiborne** • **Earlier in her career: served as the President at Donna Karan International** • Holds Marketing and Merchandising degree from Ball State University in Indiana
Paul Deneve	Senior Management	Vice President, Special Project (2013)	• 2013- present: served as the Vice President of Special Projects at Apple • **Prior to Apple: served as the Chief Executive Officer at Saint Laurent Paris** • **Prior to Saint Laurent: held top positions in the fashion industry including the President at Lanvin and Nina Ricci, as well as the Managing Director at Courreges.** • 1990 to 1997: held sales and marketing roles at Apple in Europe.

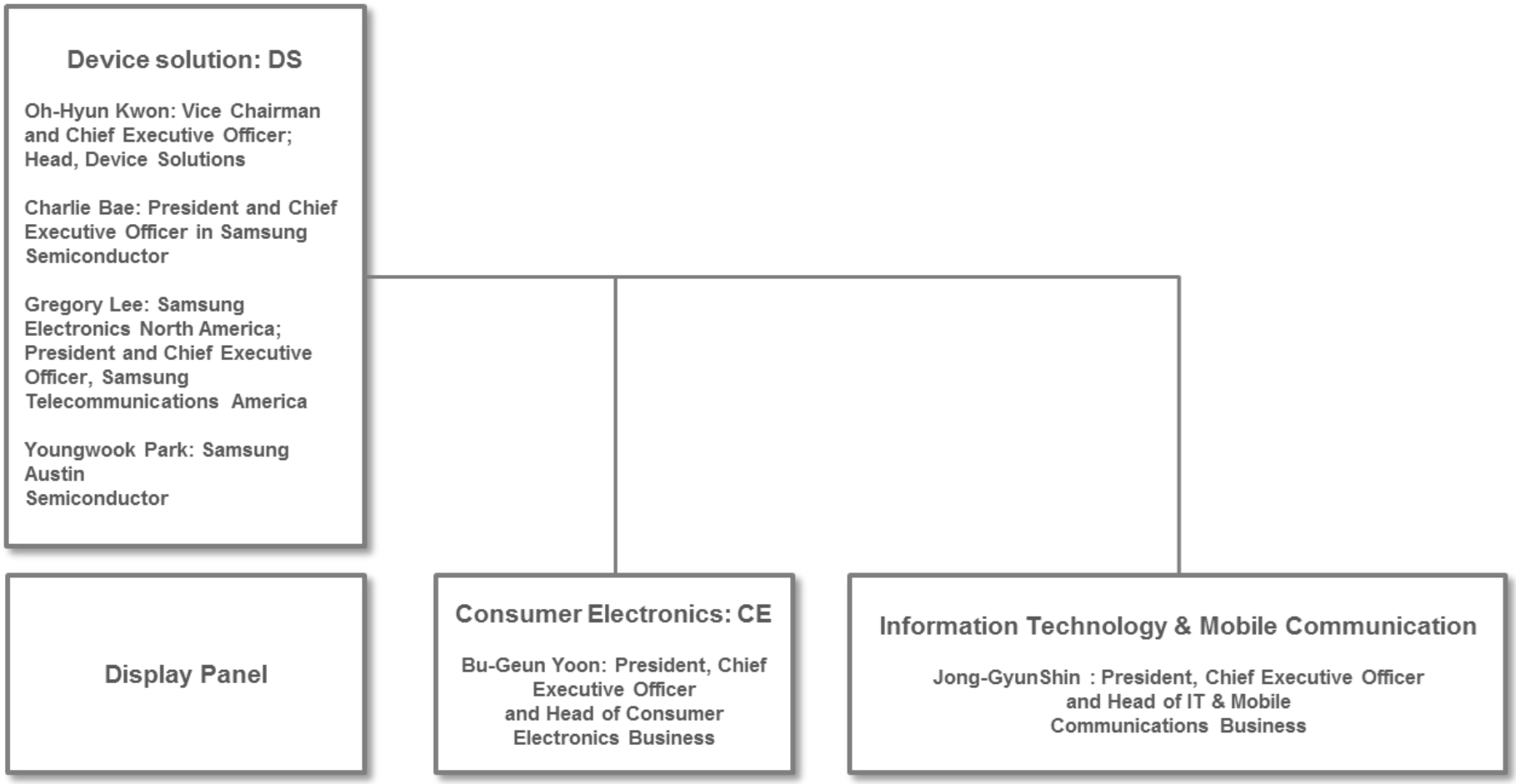
Top Executive board members' profiles of Apple in 2014(sources: the company's webpages and Marketline report 2014)

Google			
Name (age)	**Board**	**Position With the Company (Since)**	**Background (Academic and professional areas)**
Eric E. Schmidt (58)	Executive Board	Executive Chairman (2011)	• 2011- Present: has been the Executive Chairman at Google since 2011. • 2001- Present: has been a Director at the company • 2001 – 2011: served as the Chief Executive Officer. • From 2001 to 2004, was the Chairman, and again from 2007 to 2011. ○ Prior to joining Google ○ **1997 – 2001: served as the Chairman at Novell and as the Chief Executive Officer at Novell.** ○ **1983- 1997: held various positions at Sun Microsystems, including as the Chief Technology Officer from 1994 to 1997, and the President at Sun Technology Enterprises from 1991 until 1994.** ○ **He was previously a Director at Apple from 2006 to 2009**.
Larry Page (41)	Executive Board	Chief Executive Officer and Co-Founder (2011)	• **2011 –Present: has been the Chief Executive Officer and Co-Founder at Google** ○ 1998- Present: has been a Director ○ 2001 – 2011: served as the President, Products. ○ 1998 – 2001: served as the Chief Executive Officer ○ 1998 – 2002: served as the Chief Financial Officer
Sergey Brin (40)	Executive Board	Co-Founder (1998)	• 1998- Present: has been a director, and currently directs special projects at the company. • 1998-Present: he has been a Director at the company • **2001 - 2011: he served as the President, Technology.** • **1998 – 2001: he served as the President and Chairman at Google.** • **1998: co-founded Google.**
John L. Hennessy (61)	Executive Board	Lead Independent Director (2007)	• 2007- -Present: has been the Lead Independent Director at Google • 2004-Present: has been a Director at Google • **2002- Present: He is also a Director at Cisco Systems** • **2000- Present: served as the President at Stanford University** ○ **1994 – 2000: held various positions at Stanford, including the Dean at the Stanford University School of Engineering and the Chair of the Stanford University Department of Computer Science.** • 1998- 2010: co-Founded and served as the Chairman at Atheros Communications from 1998 to 2010.

Top Executive board members' profiles of Google in 2014 (sources: the company's webpages and Marketline report 2014)

Samsung			
Name (age)	**Board**	**Position With the Company (Since)**	**Background (Academic and professional areas)**
Oh-Hyun Kwon (61)	Vice Chairman & CEO	**Vice Chairman and Chief Executive Officer; Head, Device Solutions** (2012)	• 2012- Present: has been served as the Vice Chairman and Chief Executive Officer at Samsung since 2012 • 2011 – Present: has been the Head of Device Solutions at the company • 2008: was appointed as the President of Semiconductor Business (now Device Solutions) • 2004: appointed as the President and General Manager of the System LSI Division • 2000: became the Executive Vice President and Head of LSI Technology. • 1998: appointed as the Senior Vice President and the Head of System LSI Division's ASIC business. • 1995: promoted as the Vice President of Samsung's Memory Device Technology unit • **1985 : joined Samsung's semiconductor business**
Jong-Gyun Shin (57)	President & CEO	President, Chief Executive Officer and **Head of IT & Mobile Communications Business** (2013)	• 2013- Present: has been the President and Chief Executive Officer at Samsung • 2012- Present: has been **the Head of IT & Mobile Communications Business at Samsung**
Bu-Geun Yoon (60)	President & CEO	President, Chief Executive Officer and **Head of Consumer Electronics Business** (2013)	• 2013- Present: has been the President and Chief Executive Officer at Samsung • 2012- Present: has been **the Head of Consumer Electronics Business at Samsung**
Charlie Bae	President and Chief Executive Officer	Samsung Semiconductor	• Unknown- Present: serves as the President and Chief Executive Officer of Samsung Semiconductor at Samsung. • **For the past 25 years has held various strategic marketing and sales management positions within Samsung in Korea and Europe.** • **Prior to his appointment at SSI, he was the Senior Vice President of memory sales at Samsung.** • **Prior to that, he served as the President at Samsung Semiconductor Europe. He began his career at Samsung in the Memory Application engineering division in Korea.**
Gregory Lee	President and Chief Executive Officer	Samsung Electronics North America; President and Chief Executive Officer, Samsung Telecommunications America (2013)	• 2013-Present: has been the President and Chief Executive Officer of Samsung Electronics North America and Samsung Telecommunications America at Samsung • 2010: he was the President and Chief Executive Officer at Samsung Asia ○ Led the regional headquarters for all Samsung businesses in Southeast Asia and Oceania for three years. • **2004: joined Samsung and held the position of the Chief Marketing Officer for Samsung Electronics globally.** Before joining Samsung, he served Johnson & Johnson, Kellogg's and Procter & Gamble in general management and marketing fields.
Youngwook Park	President	Samsung Austin Semiconductor (2013)	• 2013- Present: has been the President of Samsung Austin Semiconductor at Samsung since 2013. • **2010: returned to Korea and led the System LSI Advanced Process Team,** **Manufacturing Tech Team and Technology Development Team. Samsung** • **2006 – 2009: served as the Chief Operating Officer at Siltronic Samsung Wafer in Singapore** • **1991: joined the research and development arm at Samsung Electronics' Semiconductor business**

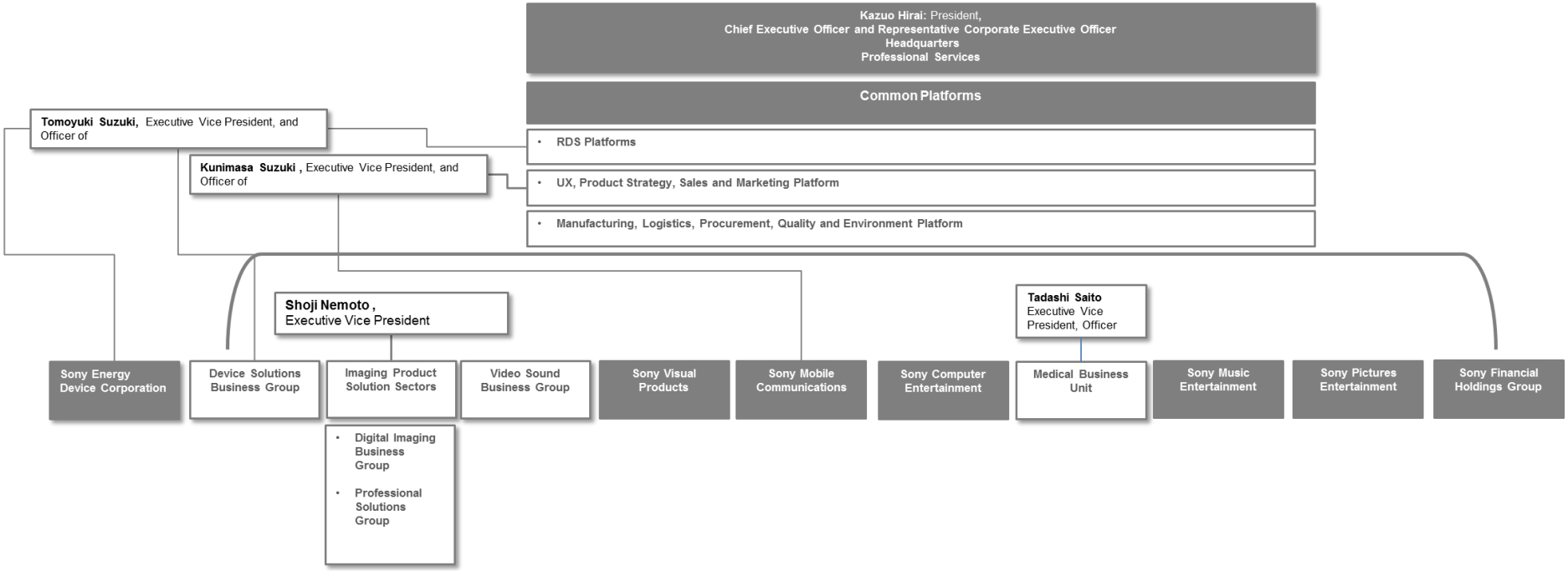
Top Executive board members' profiles of Samsung in 2014 (sources: the company's webpages and Marketline report 2014)



The organization structure of Samsung electronics in 2014 (sources: the company's webpages and Marketline report 2014)

Sony			
Name (age)	**Board**	**Position With the Company (Since)**	**Background (Academic and professional areas)**
Kazuo Hirai	Executive Board	President**, Chief Executive Officer and Representative Corporate Executive Officer** (2012)	• April 2012 –Present: has been the President, Chief Executive Officer and a Representative Corporate Executive Officer at Sony • June 2012- Present: has also been a Director at the group • Previously, Mr. Hirai held several positions within the company, including the following: ○ **Executive Deputy President; Executive Vice President; President and Group Chief Executive Officer at SCEI; Group Executive Officer at Sony, President and Group Chief Operating Officer at SCEI; President and Chief Executive Officer at SCEA; and Executive Vice President and Chief Operating Officer at SCEA.** • 1984: began his career in Sony at CBS/Sony Inc. (currently Sony Music Entertainment).
Tadashi Saito (60)	Senior Management	Executive Vice President, Officer in charge of **Medical business, and President of Medical Business Unit** (2013)	• 2012- Present: has been an Executive Vice President at Sony, and the Officer in charge of Medical business • 2013- Present: President of Medical Business Unit • 2012: was appointed the Chief Strategy Officer at the group ○ **joined Sony in 1976, and since then, he has held several positions within the group such as Deputy President of Professional, Device and Solutions Group; President of Professional Solutions Group, Consumer, Professional and Devices Group; Deputy President of Consumer Products and Devices Group; and President of Semiconductor Business Group, among others.**
Shoji Nemoto (57)	Senior Management	Executive Vice President, and Officer in charge of **Professional Solutions Business, Digital Imaging Business and Disk Manufacturing Business, President of Imaging Products and Solutions Sector, and President of Professional Solutions Group** (2013)	• 2012- Present: has been an Executive Vice President and the Officer in charge of Professional Solutions Business, Digital Imaging Business, and Disk Manufacturing Business at Sony • 2013- Present: has also been the President of Imaging Products and Solutions Sector at the group • 2011- Present: the President of Professional Solutions Group ○ **joined the group in 1979, and since then, he has held positions such as Senior Vice President, Corporate Vice President at Sony Ericsson, and Executive Officer.**
Tomoyuki Suzuki (59)	Senior Management	Executive Vice President, Officer in charge of **Device Solutions Business, RDS Platform, and President of Sony Energy Device Corporation** (2014)	• April 2014 –Present: Mr. Suzuki has been an Executive Vice President and the Officer in charge of Device Solutions Business, RDS Platform at Sony since • January 2014- Present: and the President of Sony Energy Device Corporation • **Joined the group in 1979 and held a variety of positions, most recently as the President of Device Solutions Business Group**.
Kunimasa Suzuki (53)	Senior Management	Executive Vice President, and Officer in charge **of PC Business, Mobile Business and UX, Product Strategy and Creative Platform** (2012)	• 2012- Present: has been an Executive Vice President and the Officer in charge of PC Business, Mobile Business and UX, Product Strategy and Creative Platform at Sony , and has also been the President and Chief Executive Officer at Sony Mobile • **Joined Sony in 1984, and since then, he has held several positions such as Deputy President of Consumer Products and Services Group, Deputy President at SCEI, Deputy President of Networked Products and Services Group, and General Manager of Consumer Products Group Corporate Planning Office, among others.**

Top Executive board members' profiles of Sony in 2014 (sources: the company's webpages and Marketline report 2014)



The Organization structure of Sony Corporation in 2014 (sources: the company's webpages and Marketline report 2014)

A.3.2. The selected cases' financial data (sales revenues, operating profits and margin rate) breakdown (sources from the selected cases' earning reports and annual reports)

Samsung

	2007 Q1				2007 Q2				2007 Q3				2007 Q4				2007FY Sales & OP			
Divisional performance	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
Semiconductor	4.48	31%	0.54	12.05%	4.26	29%	0.33	7.75%	5.01	30%	0.91	18.16%	4.91	28%	0.43	8.76%	18.66	30%	**2.21**	**11.84%**
Memory	3.3	23%			3.08	21%	0.29	9.42%	3.58	21%		0.00%	3.24	19%		0.00%		0%		
System LSI	0.57	4%			0.65	4%		0.00%	0.74	4%		0.00%	0.9	5%		0.00%		0%		
LCD	2.84	20%	0.07	2.46%	3.34	23%		0.00%	4.02	24%	0.67	16.67%	4.46	26%	0.92	20.63%	14.66	23%	**1.95**	**13.30%**
Telecom	4.6	32%	0.6	13.04%	4.5	31%	0.35	7.78%	5.08	30%	0.59	11.61%	5.37	31%	0.58	10.80%	19.55	31%	**2.12**	**10.84%**
Handsets	4.28	30%			4.23	29%		0.00%	4.8	29%		0.00%	5.07	29%		0.00%		0%		
Digital Media	1.55	11%	-0.04	-2.58%	1.45	10%	-0.06	-4.14%	1.48	9%	-0.12	-8.11%	1.64	9%	-0.13	-7.93%	6.12	10%	**-0.34**	**-5.56%**
Appliances	0.77	5%		0.00%	0.95	6%		0.00%	0.93	6%	-0.0006	-0.06%	0.86	5%	-0.03	-3.49%	3.51	6%	**-0.04**	**-1.14%**
Total	**14.39**	**100%**	**1.18**	8.20%	**14.63**	**100%**	**0.91**	6.22%	**16.68**	**100%**	**2.07**	12.41%	**17.48**	**100%**	**1.78**	10.18%	**62.5**	**100%**	**5.9**	**9.44%**

	2008 Q1				2008 Q2				2008 Q3				2008 Q4				2008FY Sales & OP			
Divisional performance	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
Semiconductor	4.39	26%	0.19	4.33%	4.58	25%	0.27	5.90%	4.78	25%	0.24	5.02%	3.92	21%	-0.56	-14.29%	**17.66**	**24%**	0.13	**0.74%**
Memory	4.34	25%	1.01	23.27%	3.21	18%		0.00%	3.03	16%		0.00%	2.39	13%		0.00%	11.58	16%		**0.00%**
System LSI					0.77	4%		0.00%	1.02	5%		0.00%	0.92	5%		0.00%	3.42	5%		**0.00%**
LCD					4.71	26%	1	21.23%	4.81	25%	0.38	7.90%	4.21	23%	-0.35	-8.31%	**18.07**	**25%**	2.04	**11.29%**
Telecom	5.55	32%	0.92	16.58%	6.14	34%	0.79	12.87%	6.58	34%	0.5	7.60%	7.73	42%	0.16	2.07%	**26.72**	**37%**	2.37	**8.87%**
Handsets					5.4	30%		0.00%	6.09	32%		0.00%	6.94	38%		0.00%	23.58	32%		**0.00%**
Digital Media	1.83	11%	0.03	1.64%	2.56	14%	-0.16	-6.25%	2.67	14%	-0.1	-3.75%	2.41	13%	-0.17	-7.05%	**9.87**	**14%**	-0.39	**-3.95%**
Appliances	0.82	5%	0.02	2.44%	1.11	6%		0.00%	1.27	7%		0.00%	0.98	5%		0.00%	4.19	6%		**0.00%**
Total	**17.11**	**100%**	**2.15**	12.57%	**18.14**	**100%**	**1.89**	10.42%	**19.26**	**100%**	**1.02**	5.30%	**18.45**	**100%**	**-0.94**	-5.09%	**72.95**	**100%**	**4.13**	**5.66%**

	2009 Q1				2009 Q2				2009 Q3				2009 Q4				2009FY Sales & OP			
Division(changed)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
DS(Device Solution)_SemiCon	**3.74**	13%	**-0.95**	-25.40%	**5.05**	16%	0.15	2.97%	**6.11**	17%	1.08	28.42%	6.89	18%	1.56	35.70%	21.79	24%	2.15	**15.61%**
Semiconductor(Memory)	2.47	9%	-0.65	-26.32%	3.13	10%		0.00%	3.8	11%			4.37	11%			13.77	15%		
Semiconductor(LSI)	0.65	2%		0.00%	0.88	3%		0.00%	1.07	3%				0%				0%		
DS(LCD)	**3.75**	13%	-0.31	-8.27%	**4.56**	14%	0.19	4.17%	**6.01**	17%	0.92	15.31%	5.72	15%	0.42	7.34%	20.04	22%	1.23	**6.14%**
Digital Media & Communication		0%	**1.1**	#DIV/0!		0%				0%				0%				0%		
DC_Telecom(wire+wireless)	**8.6**	30%	0.94	10.93%	**8.05**	25%	0.57	7.08%	**9.08**	25%	0.7	7.71%	9.11	23%	0.76	8.34%	34.3	38%	2.98	**8.69%**
DM_Digital Media	**2.93**	10%	0.15	5.12%	**3.24**	10%	0.15	4.63%	**3.54**	10%	0.06	1.69%	3.5	9%	-0.37	-10.57%	13.21	15%	-0.01	**-0.08%**
DM_appliances	1.31	5%			1.62	5%		0.00%	1.63	5%			1.53	4%			6.39	7%		
Total	**29**	**100%**	**1**	2.07%	**33**	**100%**	**3**	8.22%	**36**	**100%**	**4**	**11.76%**	**39.2484**	**100%**	**3**	**8.76%**	**90**	**100%**	**6.35**	**7.07%**

	2010 Q1				2010 Q2				2010 Q3				2010 Q4				2010FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
Semiconductor	8.2	24%	1.96	23.90%	9.53	25%	2.94	30.85%	10.66	26%	3.42	32.08%	9.25	22%	1.8	19.46%	37.64	24%	10.11	26.86%
Memory	5.59	16%			6.71	18%			7.49	19%			6.04	14%			25.83	17%		
System LSI																				
LCD	6.85	20%	0.49	7.15%	7.76	20%	0.88	11.34%	8.1	20%	0.52	6.42%	7.2	17%	0.1	1.39%	29.92	19%	1.99	6.65%
Telecom	9.18	27%	1.1	11.98%	8.78	23%	0.63	7.18%	11.12	28%	1.13	10.16%	12.11	29%	1.44	11.89%	41.2	27%	4.3	10.44%
Mobile	8.57	25%			8.05				10.38	26%			11.15	27%			38.15	25%		
Digital Media	12.61	36%	0.52	4.12%	14.54	38%	0.36	2.48%	14.3	36%	-0.23	-1.61%	15.97	38%	-0.17	-1.06%	57.26	37%	0.49	0.86%
Appliances	2.47	7%	0.34	13.77%	3.17	8%	0.2	6.31%	3.15	8%	0.02	0.63%	2.97	7%	-0.16	-5.39%	11.76	8%	0.41	3.49%

	2011 Q1				2011 Q2				2011 Q3				2011 Q4				2011FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
Semiconductor	9.18	25%	1.64	17.86%	9.16	23%	1.79	19.54%	9.48	23%	1.59	16.77%	9.17	19%	2.31	25.19%	36.99	22%	7.34	19.84%
Memory	5.87	16%			5.89	15%			5.5	13%			5.45	12%			22.7	14%		
System LSI	2.32	6%																		
DP(LCD&Display)	6.51	18%	-0.23	-3.53%	7.09	18%	-0.21	-2.96%	7.08	17%	-0.09	-1.27%	8.55	18%	-0.22	-2.57%	29.24	18%	-0.75	-2.56%
Telecom	10.64	29%	1.43	13.44%	12.18	31%	1.67	13.71%	14.9	36%	2.52	16.91%	17.82	38%	2.64	14.81%	55.53	34%	8.27	14.89%
Mobile	10.14	27%							14.42	35%			17.18	36%			53.43	32%		
DM&DA	13.52	37%	0.1	0.74%	14.07	36%	0.51	3.62%	14.36	35%	0.24	1.67%	16.96	36%	0.57	3.36%	58.92	36%	1.41	2.39%
Appliances	2.79	8%	-0.004	-0.14%	-3.06	-8%	-0.01	0.33%		0%	-0.01			0%	-0.004				-0.02	
Total	**36.99**	**100%**	**2.936**	**7.94%**	**39.44**	**100%**	**3.75**	**9.51%**	**41.27**	**100%**	**4.25**	**10.30%**	**47.3**	**100%**	**5.296**	**11.20%**	**165**	**100%**	**16.25**	**9.85%**

	2012 Q1				2012 Q2				2012 Q3				2012 Q4				2012FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
DMC	34.25	**76%**	4.77	13.93%	36.57	**77%**	4.9	13.40%	41.9	**80%**	5.88	14.03%	45.61	**81%**	6.21	13.62%	158.33	**79%**	21.76	13.74%
CE	10.67	**24%**	0.53	4.97%	12.15	**26%**	0.76	6.26%	11.6	**22%**	0.43	3.71%	13.95	**25%**	0.74	5.30%	48.37	**24%**	2.46	5.09%
VD	7.71	17%	4.27	55.38%	8.5	**18%**		0.00%	8.23	**16%**		0.00%	10.52	**19%**		0.00%	34.96	**17%**	4.27	12.21%
IM	23.22	51%			24.04	**51%**	4.19	17.43%	29.92	**57%**	5.63	18.82%	31.32	**56%**	5.44	17.37%	108.50	**54%**	15.26	14.06%
Mobile	18.9	42%			20.52	**43%**		0.00%	26.25	**50%**		0.00%	27.23	**49%**		0.00%	92.90	**46%**	0.00	0.00%
DS	16.33	**36%**	1.06	6.49%	17.03	**36%**	1.88	11.04%	17.4	**33%**	2.29	13.16%	17.52	**31%**	2.56	14.61%	68.28	**34%**	7.79	11.41%
Semiconductor	7.98	18%	0.76	9.52%	8.6	**18%**	1.11	12.91%	8.72	**17%**	1.15	13.19%	9.59	**17%**	1.42	14.81%	34.89	**17%**	4.44	12.73%
Memory	4.89	11%			5.42	**11%**		0.00%	5.22	**10%**		0.00%	5.33	**10%**		0.00%	20.86	**10%**	0.00	0.00%
DP	**8.54**	**19%**	**0.28**	3.28%	**8.25**	**17%**	**0.75**	9.09%	**8.46**	**16%**	**1.09**	12.88%	**7.75**	**14%**	**1.11**	14.32%	33.00	**16%**	3.23	9.79%
LCD	6.18	14%			5.63	**12%**		0.00%	5.4	**10%**		0.00%	4.96	**9%**		0.00%	22.17	**11%**	0.00	0.00%
Others	-5.31	-12%	0.02	-0.38%	-6	**-13%**	-0.06	1.00%	-7.12	**-14%**	-0.05	0.70%	-7.07	**-13%**	0.07	-0.99%	-25.50	**-13%**	-0.02	0.08%
Total	45.27	100%	5.85	12.92%	47.6	**100%**	6.72	14.12%	52.18	**100%**	8.12	15.56%	56.06	**100%**	8.84	15.77%	201.11	**100%**	29.05	14.44%

	2013 Q1				2013 Q2				2013 Q3				2013 Q4				2013FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
CE	**11.24**	**21%**	0.23	2.05%	12.78	**22%**	0.43	3.36%	12.05	**20%**	0.35	2.90%	14.27	**24%**	0.66	4.63%	50.33	**22%**	1.67	3.32%
VD	7.43	**14%**			7.94	**14%**			7.68	**13%**			10.07	**17%**			33.12	**14%**		
IM	**32.82**	**62%**	6.51	19.84%	35.54	**62%**	6.28	17.67%	36.57	**62%**	6.7	18.32%	33.89	**57%**	5.47	16.14%	138.82	**61%**	24.96	17.98%
Mobile	31.77	**60%**			34.58	**60%**			35.2	**60%**			32.17	**54%**			133.72	**58%**		
DS	**15.81**	**30%**	1.85	11.70%	17.05	**30%**	2.92	17.13%	17.9	**30%**	3.09	17.26%	17	**29%**	2.14	12.59%	67.76	**30%**	10.00	14.76%
Semiconductor	8.58	**16%**	1.07	12.47%	8.68	**15%**	1.76	20.28%	9.74	**16%**	2.06	21.15%	10.44	**18%**	1.99	19.06%	37.44	**16%**	6.89	18.40%
Memory	5.12	**10%**		S	5.7	**10%**			6.37	**11%**			6.52	**11%**			23.71	**10%**		
DP	7.11	**13%**	**0.77**	10.83%	**8.18**	**14%**	1.12	13.69%	**8.09**	**14%**	**0.98**	12.11%	**6.46**	**11%**	**0.11**	1.70%	29.84	**13%**	2.98	12.57%
LCD																				
Others																				
Total	52.87	**100%**	8.78	16.61%	57.46	**100%**	9.53	16.59%	59.08	**100%**	10.16	17.20%	59.28	**100%**	8.31	14.02%	228.69	**100%**	36.79	16.09%

	2014 Q1				2014 Q2				2014 Q3				2014 Q4				2014FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
CE	11.32	**21%**	0.19	1.68%	13	**25%**	0.77	5.92%	11.6	**24%**	0.05	0.43%	14.27	**27%**	0.18	1.26%	50.18	**24%**	1.18	**2.35%**
VD	7.39	**14%**			8.06	**15%**			7.21	**15%**			9.79	**19%**			32.45	**16%**		
IM	32.44	**60%**	6.43	19.82%	28.45	**54%**	4.42	15.54%	24.58	**52%**	1.75	7.12%	26.29	**50%**	1.96	7.46%	111.76	**54%**	14.56	**13.03%**
Mobile	31.36	**58%**			27.51	**53%**			23.52	**50%**			25.02	**47%**			107.41	**52%**		
DS	15.56	**29%**	1.87	12.02%	16.23	**31%**	2.09	12.88%	16.29	**34%**	2.33	14.30%	17.71	**34%**	3.13	17.67%	65.79	**32%**	9.43	**14.33%**
Semiconductor	9.39	**17%**	1.95	20.77%	9.78	**19%**	1.86	19.02%	9.89	**21%**	2.26	**22.85%**	10.66	**20%**	2.7	25.33%	39.73	**19%**	8.78	**22.10%**
Memory	6.29	**12%**			6.92	**13%**			7.93	**17%**			8.18	**16%**			29.32	**14%**		
DP	**6.1**	**11%**	**-0.08**	-1.31%	**6.33**	**12%**	**0.22**	3.48%	**6.25**	**13%**	0.06	0.76%	**7.05**	**13%**	0.47	6.67%	25.73	**12%**	0.66	**2.57%**
LCD						**0%**														
Others						**0%**														
Total	53.68	**100%**	8.49	15.82%	52.35	**100%**	7.19	13.73%	47.45	**100%**	4.06	8.56%	**52.73**	**100%**	5.29	10.03%	206.21	**100%**	25.03	**12.14%**

Sony

Divisional performance		2007 Q1				2007 Q2				2007 Q3				2007 Q4				2007FY Sales & OP			
		Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
Electronics (LCD TV etc.)		1,429.30	72.31%	84.1	5.88%	1,663.10	79.84%	106.90	6.43%	2,069.40	72.38%	166.50	8.05%	1,452.00	74.35%	-1.50	-0.10%	6,613.80	74.55%	356.00	5.38%
Game		**196.60**	**9.95%**	**-29.2**	**-14.85%**	**243.40**	**11.69%**	**-96.70**	**-39.73%**	**581.20**	**20.33%**	**12.90**	**2.22%**	**263.00**	**13.47%**	**-11.50**	**-4.37%**	**1,284.20**	**14.48%**	**-124.50**	**-9.69%**
	Hardware	**5.55**	**0.28%**			**7.17**	**0.34%**			**16.06**	**0.56%**			**8.08**	**0.41%**			**36.86**	**0.42%**		
	PS2	2.70	0.14%			3.28	0.16%			5.40	0.19%			2.35	0.12%			13.73	0.15%		
	PSP	2.14	0.11%			2.58	0.12%			5.76	0.20%			3.41	0.17%			13.89	0.16%		
	PS3	0.71	0.04%			1.31	0.06%			4.90	0.17%			2.32	0.12%			9.24	0.10%		
	Software	**45.60**	**2.31%**			**60.90**	**2.92%**			**105.20**	**3.68%**			**55.70**	**2.85%**			**267.40**	**3.01%**		
	PS2	31.00	1.57%			38.00	1.82%			60.90	2.13%			24.10	1.23%			154.00	1.74%		
	PSP	9.90	0.50%			12.60	0.60%			18.30	0.64%			14.70	0.75%			55.50	0.63%		
	PS3	4.70	0.24%			10.30	0.49%			26.00	0.91%			16.90	0.87%			57.90	0.65%		
Pictures(Film)		231.40	11.71%	3.3	1.43%	189.60	9.10%	2.70	1.42%	223.80	7.83%	13.20	5.90%	213.10	10.91%	34.80	16.33%	857.90	9.67%	54.00	6.29%
Financial Services		184.80	9.35%	33.8	18.29%	157.50	7.56%	23.10	14.67%	135.90	4.75%	-4.20	-3.09%	102.90	5.27%	-30.10	-29.25%	581.10	6.55%	22.60	3.89%
All others (Music & others)		84.20	4.26%	7.8	9.26%	95.20	4.57%	10.80	11.34%	96.00	3.36%	10.30	10.73%	106.80	5.47%	21.30	19.94%	382.20	4.31%	50.20	13.13%
Sony Ericsson(Mobile)		489.80	24.78%	52.14	10.65%	496.00	23.81%	60.80	12.26%	599.40	20.97%	81.00	13.51%	933.50	47.80%	30.06	3.22%	2,032.00	22.91%	224.00	11.02%
Sony BMG(Music)		93.60	4.74%	3.51	3.75%	99.45	4.77%	0.09	0.09%	156.80	5.48%	30.24	19.29%	183.65	9.40%	-4.46	-2.43%	440.70	4.97%	29.38	6.67%
Total sum		2,709.70		155.45		2,944.25	141.35%	107.69	3.66%	3,862.50	135.10%	309.94		3,254.95	166.67%	38.60	1.19%	12,191.90	137.43%	611.68	5.02%
Total Sales Revenue		**1,976.50**	100.00%	**99.3**	5.02%	2,083.00	100.00%	90.50	4.34%	2,859.00	100.00%	189.40	6.62%	1,952.90	100.00%		0.00%	8,871.40	100.00%	374.50	**4.22%**

Divisional performance		2008 Q1				2008 Q2				2008 Q3				2008 Q4				2008FY Sales & OP			
		Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
Electronics (LCD TV etc.)		1,439.10	72.72%	44.4	3.09%	1653.3	79.78%	75.60	4.57%	1462.1	67.86%	-15.9	-1.09%	933.50	61.25%	-272.20	-29.16%	5488	71.00%	-168.1	-3.06%
Game		**229.60**	11.60%	**5.4**	2.35%	**268.5**	12.96%	**-39.50**	-14.71%	**393.8**	18.28%	**0.4**	0.10%	161.20	10.58%	-24.80	-15.38%	**1053.1**	13.62%	**-58.5**	-5.56%
	Hardware	**6.79**	0.34%			**8.11**	0.39%			**12.06**	0.56%		0.00%	5.12	0.34%		0.00%	**32.08**	0.42%		0.00%
	PS2	1.51	0.08%			2.5	0.12%			2.52	0.12%		0.00%	1.38	0.09%		0.00%	7.91	0.10%		0.00%
	PSP	3.72	0.19%			3.18	0.15%			5.08	0.24%		0.00%	2.13	0.14%		0.00%	14.11	0.18%		0.00%
	PS3	1.56	0.08%			2.43	0.12%			4.46	0.21%		0.00%	1.61	0.11%		0.00%	10.06	0.13%		0.00%
	Software	**53.90**	2.72%			**56.00**	2.70%			**86.00**	3.99%		0.00%	41.60	2.73%		0.00%	**237.50**	3.07%		0.00%
	PS2	19.30	0.98%			23.1	1.11%			29.7	1.38%		0.00%	11.40	0.75%		0.00%	83.5	1.08%		0.00%
	PSP	11.80	0.60%			11.8	0.57%			15.5	0.72%		0.00%	11.20	0.73%		0.00%	50.3	0.65%		0.00%
	PS3	22.80	1.15%			21.1	1.02%			40.8	1.89%		0.00%	19.00	1.25%		0.00%	103.7	1.34%		0.00%
Pictures(Film)		159.60	8.06%	-8.3	-5.20%	196.1	9.46%	11.00	5.61%	175.1	8.13%	12.9	7.37%	186.70	12.25%	14.30	7.66%	717.5	9.28%	29.9	4.17%
Financial Services		183.00	9.25%	30.6	16.72%	100.7	4.86%	-25.30	-25.12%	103.1	4.79%	-37.4	-36.28%	151.40	9.93%	0.90	0.59%	538.2	6.96%	-31.2	-5.80%
All others (Music & others)		92.10	4.65%	6.7	7.27%	90.3	4.36%	3.50	3.88%	198.6	9.22%	24.5	12.34%	158.20	10.38%	-4.30	-2.72%	539.2	6.98%	30.4	5.64%
Sony Ericsson(Mobile)		456.84	23.08%	0.1296	0.03%	448.00	21.62%	-2.08	-0.46%	363.75	16.88%	-32	-8.80%	190.89	12.52%	-55.94	-29.30%	1,459.48	18.88%	-89.886	-6.16%
Sony BMG(Music)		86.10	4.35%	-4.41	-5.12%	81.32	3.92%	-4.815	-5.92%	0.00	0.00%	0	0.00%	-167.42	-10.98%	9.23	-5.51%	0.00	0.00%	0	#DIV/0!
Total sum		2,646.34		74.5196	2.82%	2,838.22		18.405	0.65%	2,696.45		-47.5	-26.36%	1,614.47		-332.8106	-20.61%	9,795.48		-287.386	-2.93%
Total Sales Revenue		**1,979.00**	100.00%	**73.4**	3.71%	**2072.3**	100.00%	**11.00**	0.53%	**2154.6**	100.00%	**-18**	-0.84%	1,524.10	100.00%		0.00%	**7730**	100.00%	**-227**	**-2.94%**

Divisional performance	2009 Q1				2009 Q2				2009 Q3				2009 Q4				2009FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
CPD(Consumer Product & Devices)	773.40	48.34%	-2	-0.26%	799.9	48.16%	8.90	1.11%	969.8	43.34%	49.4	5.09%	684.60	39.91%	-102.80	-15.02%	3227.7	44.74%	-46.5	-1.44%
NPS(Networed Products & Services)	**246.80**	12.47%	**-39.7**	-16.09%	**352.6**	21.23%	**-58.80**	-16.68%	**606.1**	27.08%	**19.4**	3.20%	370.30	21.59%	-4.00	-1.08%	**1575.8**	21.84%	**-83.1**	-5.27%
B2B & Disc Manu.	99.10	5.01%	-12.4	-12.51%	124.6	7.50%	-2.40	-1.93%	143.5	6.41%	10.1	7.04%	137.00	7.99%	-2.50	-1.82%	504.2	6.99%	-7.2	-1.43%
Pictures	170.00	8.59%	1.8	1.06%	136.4	8.21%	-6.40	-4.69%	203.2	9.08%	14.1	6.94%	195.60	11.40%	33.30	17.02%	705.2	9.78%	42.8	6.07%
Music	108.80	5.50%	5.4	4.96%	124.5	7.50%	8.60	6.91%	163.5	7.31%	23.1	14.13%	125.80	7.33%	-0.60	-0.48%	522.6	7.24%	36.5	6.98%
Financial Services(Somny Li	227.60	11.50%	48.2	21.18%	202.10	12.17%	32.8	16.23%	205.60	9.19%	35	17.02%	216.10	12.60%	46.50	21.52%	851.40	11.80%	162.5	19.09%
Sony Ericsson(Mobile)	220.60	11.15%	-14.5	-6.57%	213.71	12.87%	-10.6	-4.96%	229.60	10.26%	-10.2	-4.44%	173.56	10.12%	0.80	0.46%	837.47	11.61%	-34.5	-4.12%
All Others	62.20	3.14%	0.6	0.96%	61.60	3.71%	-0.8	-1.30%	77.60	3.47%	1.5		60.50	3.53%	-6.10		261.90	3.63%	-4.8	
Total sum	1,908.50		-12.60	-0.66%	2,015.41	121.34%	-28.70	-1.42%	2,598.90		142.40	5.48%	1,963.46	114.47%	-35.40	-1.80%	8,486.27	117.64%	65.70	0.77%
Total Sales Revenue	**1,599.90**	80.84%	**-25.7**	-1.61%	**1661**	100.00%	**-32.60**	-1.96%	**2237.9**	100.00%	**146.1**	6.53%	1,715.20	100.00%		0.00%	**7214**	100.00%	**31.8**	**0.44%**

Divisional performance	2010 Q1				Q2				Q3				Q4				2010FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
CPD(Consumer Product & Devices)	889.50	53.55%	50.1	5.63%	885.3	51.08%	16.90	1.91%	1090.9	49.45%	26.8	2.46%	707.00	44.72%	-90.90	-12.86%	3572.7	49.75%	2.9	0.08%
NPS(Networed Products & Services)	**325.90**	19.62%	**-3.8**	-1.17%	**369.1**	21.30%	**6.90**	1.87%	**566.6**	25.68%	**45.7**	8.07%	317.70	20.10%	-13.20	-4.15%	**1579.3**	21.99%	**35.6**	**2.25%**
Pictures	132.10	7.95%	2.9	2.20%	144.8	8.35%	-4.80	-3.31%	149	6.75%	4.7	3.15%	174.10	11.01%	35.90	20.62%	600	8.36%	38.7	6.45%
Music	110.30	6.64%	7.5	6.80%	111	6.40%	8.10	7.30%	139.8	6.34%	19.5	13.95%	109.60	6.93%	3.80	3.47%	470.7	6.55%	38.9	8.26%
Financial Services(Somny Li	169.00	10.17%	30	17.75%	221.90	12.80%	43	19.38%	209.10	9.48%	32.7	15.64%	206.50	13.06%	13.10	6.34%	806.50	11.23%	118.8	14.73%
Sony Ericsson(Mobile)	0.00	0.00%	0.6	#DIV/0!		0.00%	2.6	#DIV/0!	0.00	0.00%	0.4	#DIV/0!	0.00	0.00%	0.60	#DIV/0!		0.00%	4.2	#DIV/0!
All Others	106.80	6.43%	-3.9	-3.65%	111.90	6.46%	1.2	1.07%	137.40	6.23%	9.1		91.70	5.80%	2.20		447.80	6.24%	8.6	
Total sum	1,733.60	104.37%	83.40	4.81%	1,844.00	106.39%	73.90	4.01%	2,292.80	103.93%	138.90	6.06%	1,606.60	101.63%	-48.50	-3.02%	7,477.00	104.12%	247.70	3.31%
Total Sales Revenue	**1,661.00**	100.00%	**67**	4.03%	**1733.2**	100.00%	**-32.60**	-1.88%	**2206.2**	100.00%	**137.5**	6.23%	1,580.90	100.00%	**-73.4**	-4.64%	**7181.3**	100.00%	**199.8**	**2.78%**

Divisional performance	2011 Q1				Q2				Q3				Q4				2011FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
CPD(Consumer Product & Devices)	732.30	48.99%	1.7	0.23%	779.7	49.50%	-34.60	-4.44%	996.5	54.67%	-85.7	-8.60%	628.30	39.26%	-111.20	-17.70%	3136.8	48.31%	-229.8	-7.33%
PDS(Professional, Devices & Solutions)	**309.70**	20.72%	**2.3**	0.74%	**373.4**	23.71%	**-12.30**	-3.29%	**304.1**	16.68%	**-14.8**	-4.87%	326.60	20.41%	4.60	1.41%	**1313.8**	20.23%	**-20.2**	-1.54%
Pictures	144.40	9.66%	4.3	2.98%	169.3	10.75%	20.60	12.17%	160.6	8.81%	0.7	0.44%	183.40	11.46%	8.50	4.63%	657.7	10.13%	34.1	5.18%
Music	109.60	7.33%	12.1	11.04%	103.6	6.58%	6.30	6.08%	123.4	6.77%	15.3	12.40%	106.20	6.64%	3.20	3.01%	442.8	6.82%	36.9	8.33%
Financial Services(Somny Li	201.60	13.49%	28.7	14.24%	184.10	11.69%	24.5	13.31%	220.10	12.07%	32.6	14.81%	266.10	16.63%	45.60	17.14%	871.90	13.43%	131.4	15.07%
Sony Ericsson(Mobile) _SOMC(Sony Mobile Communications)	0.00	0.00%	-31	#DIV/0!		0.00%	0	#DIV/0!	0.00	0.00%	-43.1	#DIV/0!	77.70	4.86%	105.50	135.78%	77.70	1.20%	31.4	40.41%
All Others	103.60	6.93%	-3	-2.90%	99.20	6.30%	-3.5	-3.53%	123.60	6.78%	7		116.30	7.27%	-4.00		442.70	6.82%	-3.5	-0.79%
Total sum	1,601.20		15.10	0.94%	1,709.30	108.53%	1.00	0.06%	1,928.30	105.78%	-88.00	-4.56%	1,704.60	106.51%	52.20	3.06%	6,943.40	106.93%	-19.70	-0.28%
Total Sales Revenue	**1,494.90**	100.00%	**27.5**	1.84%	**1575**	100.00%	**-1.60**	-0.10%	**1822.9**	100.00%	**-91.7**	-5.03%	1,600.40	100.00%	**-73.4**	-4.59%	**6493.2**	100.00%	**-67.3**	**-1.04%**

Divisional performance	2012 Q1				Q2				Q3				Q4				2012FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
IP&S (Imaging Products & Services)	193.80	12.79%	12.6	6.50%	182.6	11.38%	2.60	1.42%	180.5	9.27%	-2.9	-1.61%	173.50	10.01%	-10.90	-6.28%	730.4	10.74%	1.4	0.19%
Game	**118.00**	7.79%	**-3.5**	-2.97%	**148.2**	9.24%	**2.30**	1.55%	**268.5**	13.78%	**4.6**	1.71%	172.40	9.95%	-1.70	-0.99%	**707.1**	10.40%	**1.7**	0.24%
MP&C(Mobilie Product & Communiations)	285.60	18.85%	-28.1	-9.84%	300.4	18.72%	-23.10	-7.69%	318.8	16.37%	-21.3	-6.68%	352.80	20.36%	-24.70	-7.00%	1257.6	18.49%	-97.2	-7.73%
HE&S(Home Entertainment & Sound)	251.80	16.62%	-10	-3.97%	236	14.71%	-15.80	-6.69%	323.8	16.62%	-8	-2.47%	183.20	10.57%	-50.50	-27.57%	994.8	14.63%	-84.3	-8.47%
Devices	217.30	14.34%	15.9	7.32%	249.90	15.57%	29.8	11.92%	217.30	11.16%	9.7	4.46%	164.10	9.47%	-11.50	-7.01%	848.60	12.48%	43.9	5.17%
Pictures	153.40	10.12%	-4.9	-3.19%	163.00	10.16%	7.9	4.85%	208.90	10.72%	25.3	12.11%	207.40	11.97%	19.50	9.40%	732.70	10.77%	47.8	6.52%
Music	98.80	6.52%	7.3	7.39%	99.20	6.18%	7.9	7.96%	126.40	6.49%	16.4	12.97%	117.30	6.77%	5.60		441.70	6.49%	37.2	8.42%
Financial Services	194.50	12.84%	27.6	14.19%	231.40	14.42%	31.2	13.48%	266.40	13.68%	34.2	12.84%	315.40	18.20%	52.80		1,007.70	14.82%	145.8	14.47%
All Others	124.30	8.20%	27.6	22.20%	134.80	8.40%	-5.9	-4.38%	172.60	8.86%	0.7	0.41%	157.10	9.07%	68.60		588.80	8.66%	91	15.46%
Total sum	1,637.50	108.07%	44.50	2.72%	1,745.50	108.77%	36.90	2.11%	2,083.20	106.94%	58.70	2.82%	1,843.20	106.36%	47.20	2.56%	7,309.40	107.48%	187.30	2.56%
Total Sales Revenue	**1,515.20**	100.00%	**6.3**	0.42%	**1604.7**	100.00%	**30.30**	1.89%	**1948**	100.00%	**46.4**	2.38%	1,733.00	100.00%	147.10	8.49%	**6800.9**	100.00%	**230.1**	**3.38%**

Divisional performance	2013 Q1				Q2				Q3				Q4				2013FY Sales & OP			
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
IP&S (Imaging Products & Services)	173.60	10.14%	8.1	4.67%	175.5	9.88%	-2.30	-1.31%	198.1	8.21%	12.1	6.11%	194.00	10.39%	8.40	4.33%	741.2	9.54%	26.3	3.55%
Game	**117.90**	6.88%	**-14.8**	-12.55%	**155.7**	8.77%	**-0.80**	-0.51%	**441.8**	18.31%	**18**	4.07%	263.80	14.13%	-10.50	-3.98%	**979.2**	12.61%	**-8.1**	-0.83%
MP&C(Mobilie Product & Communiations)	389.00	22.71%	5.9	1.52%	418.6	23.58%	-0.90	-0.22%	461.5	19.13%	-12.6	-2.73%	361.00	19.34%	-67.40	-18.67%	1630.1	20.99%	-75	-4.60%
HE&S(Home Entertainment & Sound)	275.20	16.07%	3.4	1.24%	263.8	14.86%	-12.10	-4.59%	404	16.74%	6.4	1.58%	225.60	12.09%	-23.20	-10.28%	1168.6	15.05%	-25.5	-2.18%
Devices	196.20	11.46%	10.8	5.50%	208.10	11.72%	11.9	5.72%	216.00	8.95%	-23.8	-11.02%	173.90	9.32%	-11.90	-6.84%	794.20	10.22%	-13	-1.64%
Pictures	158.90	9.28%	3.7	2.33%	177.80	10.01%	-17.8	-10.01%	223.70	9.27%	24.3	10.86%	269.20	14.42%	41.40	15.38%	829.60	10.68%	51.6	6.22%
Music	112.00	6.54%	10.8	9.64%	115.00	6.48%	9.7	8.43%	144.70	6.00%	21.7	15.00%	131.60	7.05%	8.00		503.30	6.48%	50.2	9.97%
Financial Services	252.70	14.75%	46	18.20%	245.00	13.80%	39.2	16.00%	284.20	11.78%	47.8	16.82%	211.90	11.35%	37.30		993.80	12.79%	170.3	17.14%
All Others	130.60	7.63%	-10.8	-8.27%	131.40	7.40%	3.8	2.89%	186.10	7.71%	-1.3	-0.70%	146.50	7.85%	-50.30		594.60	7.66%	-58.6	-9.86%
Total sum	1,806.10	105.45%	63.10	3.49%	1,890.90	106.50%	30.70	1.62%	2,560.10	106.10%	92.60	3.62%	1,977.50	105.96%	-68.20	-3.45%	8,234.60	106.02%	118.20	1.44%
Total Sales Revenue	**1,712.70**	100.00%	**36.4**	2.13%	**1775.5**	100.00%	**14.80**	0.83%	**2412.8**	100.00%	**90.3**	3.74%	1,866.30	100.00%	-115.00	-6.16%	**7767.3**	100.00%	**26.5**	0.34%

Divisional performance	2014 Q1				Q2				Q3				Q4				2014FY Sales & OP	Forecast *		
	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)	Sales	(Portion)	operating profit	Margin(%)
MC(Mobile Communications)	314.30	17.37%	-2.7	-0.86%	308.4	16.22%	-172.00	-55.77%	429	16.77%	9.3	2.17%	268.30	15.50%	-49.60	-18.49%	1320	16.50%	-215	-16.29%
G&NS (Game & Network Services)	**257.50**	14.23%	**4.3**	1.67%	**309.5**	16.28%	**21.80**	7.04%	**531.5**	20.78%	**27.6**	5.19%	281.50	16.26%	-13.70	-4.87%	**1380**	17.25%	**40**	2.90%
IP&S (Imaging Products & Services)	164.60	9.09%	17.4	10.57%	178.6	9.39%	20.10	11.25%	201	7.86%	23	11.44%	165.80	9.58%	-7.50	-4.52%	710	8.88%	53	7.46%
HE&S(Home Entertainment & Sound)	285.70	15.79%	7.7	2.70%	282.4	14.85%	8.00	2.83%	413.3	16.16%	25.3	6.12%	228.60	13.21%	-28.00	-12.25%	1210	15.13%	13	1.07%
Devices	184.10	10.17%	12.5	6.79%	247.70	13.03%	29.6	11.95%	292.90	11.45%	54.5	18.61%	225.30	13.02%	3.40	1.51%	950.00	11.88%	100	10.53%
Pictures	194.80	10.76%	7.8	4.00%	182.20	9.58%	-1	-0.55%	197.60	7.73%	2.4	1.21%	315.40	18.22%	44.80	14.20%	890.00	11.13%	54	6.07%
Music	116.90	6.46%	11.4	9.75%	116.80	6.14%	11.8	10.10%	163.60	6.40%	25.4	15.53%	122.70	7.09%	4.40		520.00	6.50%	53	10.19%
Financial Services	247.00	13.65%	43.8	17.73%	269.60	14.18%	47.7	17.69%	304.90	11.92%	50.9	16.69%	228.50	13.20%	35.60		1,050.00	13.13%	178	16.95%
All Others	128.80	7.12%	-18.4	-14.29%	108.60	5.71%	-18.2	-16.76%	144.30	5.64%	-14.3	-9.91%	-637.70	-36.84%	50.90		-256.00	-3.20%	0	0.00%
Corporate and elimination					-102.20	-5.37%	-33.3	32.58%	-120.40	-4.71%	-25.7	21.35%								
Total sum	1,893.70	104.63%	83.80	4.43%	1,901.60	100.01%	-85.50	-4.50%	2,678.10	104.70%	204.10	7.62%	1,198.40	69.24%	40.30	3.36%	7,774.00	97.18%	276.00	3.55%
Total Sales Revenue	**1,809.90**	100.00%	**69.8**	3.86%	**1901.5**	100.00%	**-85.60**	-4.50%	**2557.8**	100.00%	**178.3**	6.97%	1,730.80	100.00%	-142.50	-8.23%	**8000**	100.00%	**20**	0.25%

Apple

	Product&Service	2007 Q1				Q2				Q3				Q4				2007FY Sales & OP			
		Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
1	Desktops	955.0	13.43%			914.0	17.36%			956.0	17.67%			1,195.0	19.22%	0		4,020.0	16.75%	0	
2	Portables	1,455.0	20.46%			1,354.0	25.72%			1,577.0	29.15%			1,908.0	30.69%	0		6,294.0	26.22%	0	
	sub total	**2,410.0**	**33.89%**			**2,268.0**	**43.09%**			**2,533.0**	**46.82%**			**3,103.0**	**49.91%**	**0**		**10,314.0**	**42.97%**	**0**	
	iPod	3,427.0	48.19%			1,689.0	32.09%			1,570.0	29.02%			1,619.0	26.04%	0		8,305.0	34.60%	0	
3	Other Music Related Products and Services	634.0	8.91%			653.0	12.41%			608.0	11.24%			601.0	9.67%	0		2,496.0	10.40%	0	
4	iPhone and Related Products and Services	0.0	0.00%			0.0	0.00%			5.0	0.09%			118.0	1.90%	0		123.0			
	Peripherals and Other Hardware	294.0	4.13%			309.0	5.87%			308.0	5.69%			346.0	5.57%	0		1,257.0	5.24%	0	
	Software, Service and Other Sales	347.0	4.88%			345.0	6.55%			386.0	7.13%			430.0	6.92%	0		1,508.0	6.28%	0	
	Service SoftewereTotal	981.0	13.79%			998.0	18.96%			994.0	18.37%			1,031.0	16.58%	0		4,004.0	16.68%	0	
	Total	**7,112.0**	**100.00%**			**5,264.0**	100.00%			**5,410.0**	100.00%			**6,217.0**	100.00%	0		**24,003.0**	100.00%	**4,409**	**18%**

	Product&Service	2008 Q1				Q2				Q3				Q4				2008 FY Sales & OP			
		Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
1	Desktops	1,515.0	15.77%			1,352.0	18.00%			1,373.0	18.39%			1,363.0	17.26%	0		5,603.0	17.25%	0	
2	Portables	2,037.0	21.20%			2,142.0	28.51%			2,237.0	29.97%			2,257.0	28.59%	0		8,673.0	26.70%	0	
	sub total	**3,552.0**	36.97%			**3,494.0**	46.51%			**3,610.0**	48.37%			**3,620.0**	45.85%	**0**		**14,276.0**	43.95%	**0**	
	iPod	3,997.0	41.60%			1,818.0	24.20%			1,678.0	22.48%			1,660.0	21.03%	0		9,153.0	28.18%	0	
3	Other Music Related Products and Services	808.0	8.41%			881.0	11.73%			819.0	10.97%			832.0	10.54%	0		3,340.0	10.28%	0	
4	**iPhone and Related Products and Services**	241.0	2.51%			378.0	5.03%			419.0	5.61%			806.0	10.21%	0		1,844.0	5.68%		
	Peripherals and Other Hardware	382.0	3.98%			412.0	5.48%			437.0	5.85%			428.0	5.42%	0		1,659.0	5.11%	0	
	Software, Service and Other Sales	628.0	6.54%			529.0	7.04%			501.0	6.71%			549.0	6.95%	0		2,207.0	6.80%	0	
	Service SoftewereTotal	1,436.0	14.95%			1,410.0	18.77%			1,320.0	17.68%			1,381.0	17.49%	0		5,547.0	17.08%	0	
	Total	**9,608.0**	100.00%			**7,512.0**	100.00%			**7,464.0**	100.00%			**7,895.0**	100.00%	0		**32,479.0**	100.00%	**6,275**	**19%**

	Product&Service	2009 Q1				Q2				Q3				Q4				2009 FY Sales & OP			
		Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
1	Desktops	1,043.0	10.26%			1,050.0	12.86%			1,129.0	13.54%			1,086.0	11.00%	0		4,308.0	11.79%	0	
2	Portables	2,511.0	24.70%			1,895.0	23.21%			2,200.0	26.39%			2,866.0	29.04%	0		9,472.0	25.92%	0	
	sub total	**3,554.0**	34.96%			**2,945.0**	36.08%			**3,329.0**	39.93%			**3,952.0**	40.04%	**0**		**13,780.0**	37.72%	**0**	
	iPod	3,371.0	33.16%			1,665.0	20.40%			1,492.0	17.90%			1,563.0	15.84%	0		8,091.0	22.14%	0	
3	Other Music Related Products and Services	1,011.0	9.94%			1,049.0	12.85%			958.0	11.49%			1,018.0	10.31%	0		4,036.0	11.05%	0	
4	**iPhone and Related Products and Services**	1,247.0	12.27%			1,521.0	18.63%			1,689.0	20.26%			2,297.0	23.27%	0		6,754.0	18.49%		
	Peripherals and Other Hardware	378.0	3.72%			358.0	4.39%			341.0	4.09%			393.0	3.98%	0		1,470.0	4.02%	0	
	Software, Service and Other Sales	606.0	5.96%			625.0	7.66%			528.0	6.33%			647.0	6.56%	0		2,406.0	6.59%	0	
	Service SoftewereTotal	1,617.0	15.90%			1,674.0	20.51%			1,486.0	17.82%			1,665.0	16.87%	0		6,442.0	17.63%	0	
	Total	**10,167.0**	100.00%			**8,163.0**	100.00%			**8,337.0**	100.00%			**9,870.0**	100.00%	0		**36,537.0**	100.00%	**7,658**	**21%**

	Product&Service	2010 Q1				Q2				Q3				Q4				2010 FY Sales & OP			
		Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
1	Desktops	1,692.0	10.79%			1,532.0	11.35%			1,301.0	8.29%			1,676.0	16.98%	0		6,201.0	9.51%	0	
2	Portables	2,758.0	17.59%			2,228.0	16.50%			3,098.0	19.73%			3,194.0	32.36%	0		11,278.0	17.29%	0	
	sub total	**4,450.0**	28.37%			**3,760.0**	27.85%			**4,399.0**	28.02%			**4,870.0**	49.34%	**0**		**17,479.0**	26.80%	**0**	
	iPod	3,391.0	21.62%			1,861.0	13.79%			1,545.0	9.84%			1,477.0	14.96%	0		8,274.0	12.69%	0	
3	Other Music Related Products and Services	1,164.0	7.42%			1,327.0	9.83%			1,214.0	7.73%			1,243.0	12.59%	0		4,948.0	7.59%	0	
4	**iPhone and Related Products and Services**	5,578.0	35.57%			5,445.0	40.34%			5,334.0	33.97%			8,822.0	89.38%	0		25,179.0	38.60%		
5	**iPad and Related Products and Services**	0.0	0.00%			0.0	0.00%			2,166.0	13.80%			2,792.0	28.29%	0		4,958.0	7.60%		
	Peripherals and Other Hardware	469.0	2.99%			472.0	3.50%			396.0	2.52%			477.0	4.83%	0		1,814.0	2.78%	0	
	Software, Service and Other Sales	631.0	4.02%			634.0	4.70%			646.0	4.11%			662.0	6.71%	0		2,573.0	3.94%	0	
	Service SoftewereTotal	1,795.0	11.45%			1,961.0	14.53%			1,860.0	11.85%			1,905.0	19.30%	0		7,521.0	11.53%	0	
	Total	**15,683.0**	100.00%			**13,499.0**	100.00%			**15,700.0**	100.00%			**20,343.0**	206.11%	0		**65,225.0**	100.00%	**18,385**	**28%**

	Product&Service	2011 Q1				Q2				Q3				Q4				2011 FY Sales & OP			
		Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
1	Desktops	1,731.0	11.04%			1,441.0	5.84%			1,580.0	5.53%			1,687.0	5.97%	0		6,439.0	5.95%	0	
2	Portables	3,699.0	13.83%			3,535.0	14.33%			3,525.0	12.34%			4,585.0	16.22%	0		15,344.0	14.17%	0	
	sub total	**5,430.0**	20.31%			**4,976.0**	20.17%			**5,105.0**	17.87%			**6,272.0**	22.19%	**0**		**21,783.0**	20.12%	**0**	
	iPod	3,425.0	12.81%			1,600.0	6.49%			1,325.0	4.64%			1,103.0	3.90%	0		7,453.0	6.89%	0	
3	Other Music Related Products and Services	1,431.0	5.35%			1,634.0	6.62%			1,571.0	5.50%			1,678.0	5.94%	0		6,314.0	5.83%	0	
4	**iPhone and Related Products and Services**	10,468.0	39.15%			12,298.0	49.86%			13,311.0	46.59%			10,980.0	38.84%	0		47,057.0	43.47%		
5	**iPad and Related Products and Services**	4,608.0	17.23%			2,836.0	11.50%			6,046.0	21.16%			6,868.0	24.29%	0		20,358.0	18.81%		
	Peripherals and Other Hardware	593.0	2.22%			580.0	2.35%			517.0	1.81%			640.0	2.26%	0		2,330.0	2.15%	0	
	Software, Service and Other Sales	786.0	2.94%			743.0	3.01%			696.0	2.44%			729.0	2.58%	0		2,954.0	2.73%	0	
	Service SoftewereTotal	2,217.0	8.29%			2,377.0	9.64%			2,267.0	7.93%			2,407.0	8.51%	0		9,268.0	8.56%	0	
	Total	**26,741.0**	100.00%			**24,667.0**	100.00%			**28,571.0**	100.00%			**28,270.0**	100.00%	0		**108,249.0**	100.00%	**33,790**	**31%**

	Product&Service	2012 Q1				Q2				Q3				Q4				2012 FY Sales & OP			
		Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
1	Desktops	1,936.0	4.18%			1,563.0	3.99%			1,287.0	3.67%			1,254.0	3.49%	0		6,040.0	3.86%	0	
2	Portables	4,662.0	10.06%			3,510.0	8.96%			3,646.0	10.41%			5,363.0	14.91%	0		17,181.0	10.98%	0	
	sub total	**6,598.0**	14.24%			**5,073.0**	12.95%			**4,933.0**	14.09%			**6,617.0**	18.40%	**0**		**23,221.0**	14.84%	**0**	
	iPod	2,528.0	5.46%			1,207.0	3.08%			1,060.0	3.03%			820.0	2.28%	0		5,615.0	3.59%	0	
3	Other Music Related Products and Services	2,027.0	4.37%			2,151.0	5.49%			2,060.0	5.88%			2,296.0	6.38%	0		8,534.0	5.45%	0	
4	**iPhone and Related Products and Services**	24,417.0	52.70%			22,690.0	57.90%			16,245.0	46.38%			17,125.0	47.61%	0		80,477.0	51.42%		
5	**iPad and Related Products and Services**	9,153.0	19.75%			6,590.0	16.82%			9,171.0	26.19%			7,510.0	20.88%	0		32,424.0	20.72%		
	Peripherals and Other Hardware	766.0	1.65%			643.0	1.64%			663.0	1.89%			706.0	1.96%	0		2,778.0	1.77%	0	
	Software, Service and Other Sales	844.0	1.82%			832.0	2.12%			891.0	2.54%			892.0	2.48%	0		3,459.0	2.21%	0	
	Service SoftewereTotal	2,871.0	6.20%			2,983.0	7.61%			2,951.0	8.43%			3,188.0	8.86%	0		11,993.0	7.66%	0	
	Total	**46,333.0**	100.00%			**39,186.0**	100.00%			**35,023.0**	100.00%			**35,966.0**	100.00%	0		**156,508.0**	100.00%	**55,241**	**35%**

	Product&Service	2013 Q1				Q2				Q3				Q4				2013 FY Sales & OP			
		Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
	iPhone	30,660.0	56.24%			22,955.0	52.65%			18,154.0	51.39%			19,510.0	52.07%	0		91,279.0	53.41%	0	
	iPad	10,674.0	19.58%			8,746.0	20.06%			6,374.0	18.04%			6,186.0	16.51%	0		31,980.0	18.71%	0	
	Mac	5,519.0	10.12%			5,447.0	12.49%			4,893.0	13.85%			5,624.0	15.01%	0		21,483.0	12.57%	0	
	iPod	2,143.0	3.93%			962.0	2.21%			733.0	2.08%			573.0	1.53%	0		4,411.0	2.58%	0	
	iTunes/Software/Services	3,687.0	6.76%			4,114.0	9.44%			3,990.0	11.30%			4,260.0	11.37%	0		16,051.0	9.39%		
	Accessories	1,829.0	3.36%			1,379.0	3.16%			1,179.0	3.34%			1,319.0	3.52%	0		5,706.0	3.34%		
	Total	**54,512.0**	100.00%			**43,603.0**	100.00%			**35,323.0**	100.00%			**37,472.0**	100.00%	0		**170,910.0**	100.00%	**48,999**	**29%**

Product&Service	2014 Q1				Q2				Q3				Q4				2014 FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
iPhone	32,496.0	56.42%			26,064.0	57.10%			19,751.0	52.77%			23,678.0	56.21%			101,989.0	55.79%		
iPad	11,468.0	19.91%			7,610.0	16.67%			5,889.0	15.73%			5,316.0	12.62%			30,283.0	16.57%		
Mac	6,395.0	11.10%			5,519.0	12.09%			5,540.0	14.80%			6,625.0	15.73%			24,079.0	13.17%		
iPod	973.0	1.69%			461.0	1.01%			442.0	1.18%			410.0	0.97%			2,286.0	1.25%		
iTunes/Software/Services	4,397.0	7.63%			4,573.0	10.02%			4,485.0	11.98%			4,608.0	10.94%			18,063.0	9.88%		
Accessories	1,863.0	3.23%			1,419.0	3.11%			1,325.0	3.54%			1,486.0	3.53%			6,093.0	3.33%		
Total	**57,592.0**	100.00%			**45,646.0**	100.00%			**37,432.0**	100.00%			**42,123.0**	100.00%			**182,793.0**	100.00%	**52,503**	**29%**

Google

Product&Service	2007 Q1				Q2				Q3				Q4				2007FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	37.00	1.01%			34	0.88%			41	0.97%			69	1.43%			181	1.09%		
Network	1,345.00	36.71%			1352	34.92%			1455	34.39%			1636	33.89%			5,788.00	34.88%		
Google.com	2,282.00	62.28%			2486	64.20%			2735	64.64%			3122	64.68%			10,625.00	64.03%		
Total	**3,664.00**	**100.00%**	**1221.2**	**33.33%**	**3872**	100.00%	**1104.6**	**28.53%**	**4231**	100.00%	**1318**	**31.15%**	**4827**	100.00%	**1441**	**29.85%**	16,594.00	100.00%	5,084.80	**30.64%**

Product&Service	2008 Q1				Q2				Q3				Q4				2008FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	100.00	1.93%			182	3.39%			189	3.41%			197	3.46%			668	3.06%		
Network	1,686.00	32.51%			1655	30.84%			1680	30.32%			1693	29.70%			6,714.00	30.81%		
Google.com	3,400.00	65.56%			3530	65.77%			3672	66.27%			3811	66.85%			14,413.00	66.13%		
Total	**5,186.00**	100.00%	**1546**	**29.81%**	**5367**	100.00%	**1578**	**29.40%**	**5541**	100.00%	**1318**	**23.79%**	**5701**	100.00%	**1441**	**25.28%**	21,795.00	100.00%	5,883.00	**26.99%**

Product&Service	2009 Q1				Q2				Q3				Q4				2009 Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	178.00	3.23%			186	3.37%			188	3.16%			209	3.13%			761	3.22%		
Network	1,638.00	29.73%			1684	30.49%			1801	30.29%			2044	30.63%			7,167.00	30.30%		
Google.com	3,693.00	67.04%			3653	66.14%			3956	66.54%			4421	66.24%			15,723.00	66.48%		
Total	**5,509.00**	100.00%	**1884**	**34.20%**	**5523**	100.00%	**1874**	**33.93%**	**5945**	100.00%	**2074**	**34.89%**	**6674**	100.00%	**2481**	**37.17%**	23,651.00	100.00%	8,313.00	**35.15%**

Product&Service	2010 Q1				Q2				Q3				Q4				2010FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	300.00	4.43%			258	3.78%			254	3.49%			273	3.23%			1085	3.70%		
Network	2,036.00	30.05%			2063	30.25%			2199	30.18%			2495	29.56%			8,793.00	29.99%		
Google.com	4,439.00	65.52%			4499	65.97%			4833	66.33%			5672	67.20%			19,443.00	66.31%		
Total	**6,775.00**	100.00%	**2488**	**36.72%**	**6820**	100.00%	**2365**	**34.68%**	**7286**	100.00%	**2547**	**34.96%**	**8440**	100.00%	**2982**	**35.33%**	29,321.00	100.00%	10,382.00	**35.41%**

Product&Service	2011	Q1			Q2				Q3				Q4				2011FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	269.00	3.14%			310	3.43%			385	3.96%			410	3.87%			1374	3.62%		
Network	2,427.00	28.30%			2484	27.52%			2595	26.70%			2880	27.21%			10,386.00	27.40%		
Google.com	5,879.00	68.56%			6232	69.04%			6740	69.34%			7294	68.92%			26,145.00	68.98%		
Total	**8,575.00**	100.00%	**2296**	**26.78%**	**9026**	100.00%	**2881**	**31.92%**	**9720**	100.00%	**3058**	**31.46%**	**10584**	100.00%	**3507**	**33.13%**	37,905.00	100.00%	11,742.00	**30.98%**

Product&Service	2012	Q1			Q2				Q3				Q4				2012FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	420.00	3.95%			439	3.59%			666	4.72%			829	5.75%			2354	4.58%		
Network	2,913.00	27.36%			2983	24.42%			3133	22.22%			3436	23.83%			12,465.00	24.26%		
Google.com	7,312.00	68.69%			7542	61.75%			7727	54.80%			8640	59.92%			31,221.00	60.77%		
Motorola(Hardware & Others)					**1250**	**10.23%**	**-233**	**-19%**	**2575**	**18.26%**	**-527**	**-20%**	**1514**	**10.50%**	**-353**	**-23%**	**5,339.00**	**10.39%**	**-1,113.00**	**-21%**
Total	**10,645.00**	100.00%	**3389**	**31.84%**	**12214**	100.00%	**3203**	**26.22%**	**14101**	100.00%	**2736**	**19.40%**	**14419**	100.00%	**3394**	**23.54%**	51,379.00	100.00%	12,722.00	**24.76%**

Product&Service	2013	Q1			Q2				Q3				Q4				2013FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	1049	7.51%			1046	7.42%			1230	8.26%			1243	7.37%			4400	7.35%		
Network	3,262.00	23.35%			3193	22.64%			3148	21.14%			3522	20.89%			13,125.00	21.94%		
Google.com	8,640.00	61.85%			8868	62.87%			9394	63.08%			10551	62.59%			37,453.00	62.60%		
Motorola(Hardware & Others)	**1,018.00**	7.29%	**-271**	**-27%**	**998**	7.08%	**-342**	**-34%**	**1184**	7.95%	**-248**	**-21%**	**1647**	9.77%	**-353**	**-21%**	**4,847.00**	8.10%	**-1,214.00**	**-25%**
Total	**13,969.00**	100.00%	**3477**	**24.89%**	**14105**	100.00%	**3123**	**22.14%**	**14893**	100.00%	**3444**	**23.12%**	**16858**	100.00%	**3992**	**23.68%**	59,825.00	100.00%	14,036.00	**23.46%**

Product&Service	2014	Q1			Q2				Q3				Q4				2014 FY Sales & OP			
	Revenue	(Portion)	Operating Profit	Operating Margin	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	Margin(%)	Revenue	(Portion)	operating profit	OP Margin(%)
Licensing and Other	1554	10.08%			1596	10.00%			1841	11.14%			1954	10.79%			6945	10.52%		
Network	3,397.00	22.03%			3424	21.46%			3430	20.76%			3720	20.55%			13,971.00	21.17%		
Google.com	10,469.00	67.89%			10935	68.54%			11252	68.10%			12429	68.66%			45,085.00	68.31%		
Motorola(Hardware & Others)		0.00%		**#DIV/0!**		0.00%		**#DIV/0!**		0.00%		**#DIV/0!**		0.00%		**#DIV/0!**	**0.00**	0.00%	**0.00**	**#DIV/0!**
Total	**15,420.00**	100.00%	**4115**	**26.69%**	**15955**	100.00%	**4258**	**26.69%**	**16523**	100.00%	**3724**	**22.54%**	**18103**	100.00%	**4399**	**24.30%**	66,001.00	100.00%	16,496.00	**24.99%**

A.3.3. R&D expense and R&D intensity of the selected cases

Samsung (Trillion KRW)

	1Q		2Q		3Q		4Q		FY Total	
	R&D expense	R&D intensity (%)	R&D expense	R&D intensity (%)	R&D expense	R&D intensity (%)	R&D expense	R&D intensity (%)	R&D	R&D intensity (%)
2007	1.08	7.49%	0.90	6.15%	1.02	6.09%	1.04	5.95%	3.99	6.38%
2008	0.95	5.55%	1.09	6.00%	1.05	5.43%	1.21	6.28%	4.33	5.94%
2009	1.11	3.88%	1.05	3.24%	1.24	3.46%	1.27	3.53%	4.67	5.21%
2010	2.05	5.93%	2.31	6.08%	2.31	5.75%	2.43	5.80%	9.10	5.88%
2011	2.34	6.34%	2.46	6.25%	2.43	5.89%	2.74	5.80%	9.98	6.05%
2012	2.73	6.03%	2.87	6.04%	2.98	5.70%	2.96	5.27%	11.53	5.73%
2013	3.33	6.30%	3.54	6.16%	3.66	6.19%	3.79	6.39%	14.32	6.26%
2014	3.69	6.87%	3.70	7.07%	3.34	7.04%	3.65	6.92%	14.39	6.98%

Sony (bln yen)

	R&D expense	R&D intensity (%)
2007	520.60	5.87%
2008	497.30	6.43%
2009	432.00	5.99%
2010	426.80	5.94%
2011	433.50	6.68%
2012	473.60	6.96%
2013	466.00	6.00%
2014	485.00	6.06%

Apple $ Mn

	R&D expense	R&D intensity (%)
2007	782	**3.26%**
2008	1,109	**3.41%**
2009	1,333	**3.65%**
2010	1782	**2.73%**
2011	2429	**2.24%**
2012	3381	**2.16%**
2013	4475	**2.62%**
2014	6041	**3.30%**

Google $ Mn

	1Q		2Q		3Q		4Q		FY Total	
	R&D expense	R&D intensity (%)	R&D expense	R&D intensity (%)	R&D expense	R&D intensity (%)	R&D expense	R&D intensity (%)	R&D expense	R&D intensity (%)
2007	408.40	11.15%	532.10	13.74%	549.00	12.98%	631.00	13.07%	2,120.50	**12.78%**
2008	673.00	12.98%	682.00	12.71%	705.00	12.72%	733.00	12.86%	2,793.00	**12.81%**
2009	642.00	11.65%	708.00	12.82%	758.00	12.75%	736.00	11.03%	2,844.00	**12.02%**
2010	818.00	12.07%	898.00	13.17%	994.00	13.64%	1,051.00	12.45%	3,761.00	**12.83%**
2011	1,226.00	14.30%	1,234.00	13.67%	1,404.00	14.44%	1,298.00	12.26%	5,162.00	**13.62%**
2012	1,441.00	13.54%	1,585.00	12.98%	2,009.00	14.25%	1,935.00	13.42%	6,970.00	**13.57%**
2013	1,837.00	13.15%	1,987.00	14.09%	2,017.00	13.54%	2,111.00	12.52%	7,952.00	**13.29%**
2014	2,126.00	13.79%	2,238.00	14.03%	2,655.00	16.07%	2,813.00	15.54%	9,832.00	**14.90%**

	MS (Software and internet)					
	R&D Spend ($Bn)	Revenue ($, million)	Net Income ($, million)	Net Profit Margin (%)	Stock Price ($)	R&D intensity
2005	7.8	39788	12254	31%	24.84	20%
2006	6.2	44282	12599	28%	23.3	14%
2007	6.6	51122	14065	28%	29.47	13%
2008	7.1	60420	17681	29%	27.51	12%
2009	8.2	58437	14569	25%	23.77	14%
2010	9	62484	18760	30%	23.01	14%
2011	8.7	69943	23150	33%	26	13%
2012	9	73723	16978	23%	30.59	13%
2013	9.8	77849	21863	28%	34.55	13%
2014	10.4	86833	22074	25%	41.7	13%

	Nokia (Computing and electronics)					
	R&D Spend ($Bn)	Revenue ($, million)	Net Income ($, million)	Net Profit Margin (%)	Stock Price ($)	R&D intensity
2005	4.6	40461.61	4279.64	10.58%	21.67	11.37%
2006	4.8	54250.4	5680.84	10.47%	26.81	8.85%
2007	4.9	75270.71	10621.29	14.11%	56.51	6.51%
2008	7.9	71645.53	5634.56	7.86%	21.99	11.03%
2009	9	58738.27	1276.98	2.17%	18.42	15.32%
2010	8.2	56249.44	2451.62	4.36%	13.68	14.58%
2011	7.8	18171.7	-1323.5	-7.28%	6.24	20.88%
2012	7.8	17525.4	-3533.5	-20.16%	5.22	20.01%
2013	6.1	14463	-699.9	-4.84%	11.16	20.61%
2014		14489.1	3939.8	27.19%		19.40%

	ZTE					
	R&D Spend ($, million)	Revenue ($, million)	Net Income ($, million)	Net Profit Margin (%)	Stock Price ($)	R&D intensity
2005		2673.26	159.55	5.97%	3.35	0.00%
2006		2945.75	98.1	3.33%	4.51	0.00%
2007		4754.04	171.17	3.60%	4.79	0.00%
2008		6462.41	242.22	3.75%	1.07	0.00%
2009		8817.88	359.62	4.08%	6.04	0.00%
2010		10623.9	491.44	4.63%	3.74	0.00%
2011	1359.8	13810.2	329.9	2.39%	3.04	9.85%
2012	1413.6	13468.3	-454.9	-3.38%	1.61	10.50%
2013	1182.2	12045.7	217.4	1.80%	2.08	9.81%
2014		13007.8	422.1	3.24%		0.00%

	HTC					
	R&D Spend ($, million)	Revenue ($, million)	Net Income ($, million)	Net Profit Margin (%)	Stock Price ($)	R&D intensity
2005						
2006		3232.4	774.59	23.96%	14.5	0.00%
2007		3635.19	889.87	24.48%	17.54	0.00%
2008		4642.2	872.52	18.80%	9.49	0.00%
2009		4482.16	701.33	15.65%	10.83	0.00%
2010		9480.67	1344.54	14.18%	29.15	0.00%
2011	519.5	14849.5	1975.8	13.31%	16.32	3.50%
2012	493.9	9214	536	5.82%	10.32	5.36%
2013	399.9	6484.5	-42.2	-0.65%		6.17%
2014	415.8	5990.6	47.4	0.79%		6.94%

	Matsushita (Panasonic)					
	R&D Spend ($Bn)	Revenue ($, million)	Net Income ($, million)	Net Profit Margin (%)	Stock Price ($)	R&D intensity
2005	5.7					
2006	5					
2007	4.9					
2008	4.8					
2009	5.2					
2010	5.1					
2011	6.2	73018.4	621.7	0.85%		8.49%
2012	6.6	65908.2	-6486.2	-9.84%		10.01%
2013	6.1	61345.6	-6335.7	-10.33%		9.94%
2014		64986.9	1011.7	1.56%		0.00%

	Matsushita (Panasonic)					
	R&D Spend ($Bn)	Revenue ($, million)	Net Income ($, million)	Net Profit Margin (%)	Stock Price ($)	R&D intensity
2005	5.7					
2006	5					
2007	4.9					
2008	4.8					
2009	5.2					
2010	5.1					
2011	6.2	73018.4	621.7	0.85%		8.49%
2012	6.6	65908.2	-6486.2	-9.84%		10.01%
2013	6.1	61345.6	-6335.7	-10.33%		9.94%
2014		64986.9	1011.7	1.56%		0.00%

(Data sources: http://www.bloomberg.com/research, & 2015 Hoover's, Inc)