

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

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Currently, there is growing interest in shaping a digital ecosystem that embraces holistic design approaches. In the digital realm, organizational approaches to managing design are required to shift to ‘designing’ towards holistic digital design, rather than ‘design’ for a completed output.

Within this context, this paper reviews how organizational cultures can impact the development of holistic product design in competitive digital landscapes. This is done by investigating different organizational cultures as reflected in large Eastern and Western organizations’ approaches to managing design in the new product development (NPD) process. Despite significances of ‘designing’ this study discovered ambidexterity aspects of digital design in NPD projects, from international organizational perspectives. The findings offer key understandings that can explain the dilemmatic relations by examining key differences of design priorities in new digital product development in the East and the West: namely the East focusing on ‘design output’; whereas the West expecting ‘design outcomes’. Based on this we propose two major scenarios that represent the different approaches to managing design by organizational cultures.

1. Introduction

Product design has been defined as a major competitive element of manifestations of organization as a tangible asset (Karjalainen & Snelders, 2010). Because product design is vital for an organization in order to sustain its business by reducing varying level of unprecedented uncertainty surrounding an organization whilst processing of meeting the demand for large volumes of standardized product (Yoo, et al., 2006; Weick, 2004). So an organization is likely configured and designed by interacting with logics of product design. That organizational logic with product design has been thus expected as objectified, stable and precedent

predictability-based rationality for best competitive operation. In this sense all those technical objects (i.e. product or service) adapted by humans’ specialized disciplines have been defined as *milieu* that humans’ problem solving process is involved as their social actions (Simondon, 1980; Simon, 1996; Margolin, 1995). This infers product design can be defined as manifestation of an organization on its own right way.

However as principles of product design evolve different organizational approaches are required. Since traditional design principles were based on single hierarchical modular architecture the organization structure was also characterized as a centralized model that is a vertically integrated single hierarchical type for efficiently

maximizing its profits in reductionist approach (Yoo, et al., 2010; Clark, 1985). Whereas, recent approaches to managing design for digital products are underlined in a concept of '*Designing*'. A status of designing is ongoing and evolutionary actions through a design process as the design actions respond to continually changing ill-defined humans' problematic situations in its conceptualising and structuralising design process. Designing is thus characterised as design for incompleteness. This is distinguished from '*design*' as a noun that is accomplished as a completed *output* of a design process (Garud, et al., 2008).

In fact, the digital product is carried out in 'designing' across a layered modular architecture consisting of several layers where enormous heterogeneities among them are laid: physical devices, networks, services and contents. And that product architecture constitutes into a *digital product platform*. And so a well-established *digital platform* can enable to jointly build a *digital ecosystem* with diverse organizations for a digital product as a whole in the digital ecosystem (Yoo, et al., 2010; Eaton, et al., 2011; Gawer, 2009). Those competitive landscapes between designing participants for digital product platform resulting in a digital product is defined as the *digital landscape*. That key inference is that digital artefacts embrace ideas of '*holistic design*' to cover heterogeneities of those entire digital landscapes and uncertainties (Yoo, 2010; Yoo, et al., 2010; see also McKelvey, 1982).

The studies above illustrate that current approaches to designing can be placed in dilemmatic challenges with traditional organizational approaches to managing design. In this context, the study raises key issues about how approaches to managing holistic digital product design (i.e. designing) is hindered or enabled by organizational contexts. We contend that it can be examined by looking at organizational cultures reflected in new digital product development process and it can be clarified distinctively different organizational cultures in East Asia and West.

2. Research background

Shifting logic of organization for digital design, *designing*

We take a concept of platform in new product development process to clarify a concept of designing. That meaning of platform' contains a design and an idea, so it is served as a pattern or model to explain concept of complex products and systems of production for engineering design (Baldwin & Woodard, 2009), and also it is defined as 'the set of assets shared across a set of products' in industrial design (Ulrich & Eppinger, 2012). Conventional platforms were limited in an extent of internal and homogeneous product design elements that simply constitute into a set of subsystem and the

components for scale-based product families. So that the meaning of product designed is addressed in stable and fixed boundary of product for one firm's profit, which means, for instance, audio devices are designed for function of audio and printer machine for printing to fit a firm's sizable profit (i.e. internal platform). Traditional consumer electronics, computer and printer machine and automotive goods such as Sony Walkman, Hewlett-Packard's Inkjet and LaserJet printers and Japanese automobile manufacturers' car products, Mitsubishi, Honda, and Toyota have been built and designed based on those platform principles (Gawer, 2009; Ulrich & Eppinger, 2012). On the contrary, digital relevant products and services, such as Microsoft Windows operating system, Apple's iPod and iPhone, Google the Internet search engine and social networking sites, such as Facebook take place in multi-sided, heterogeneous, unstable, generative and ill-defined boundary of globally co - created industry platform (i.e. digital platform). This is neither only limited within one firm nor relevant supply chain for a product but expanded to an ecosystem that several heterogeneous firms function together in which creates new meaning of product - i.e. generativity (Yoo, et al., 2010; Krippendorff, 2011; Gawer, 2009). Development of holistic product design with digital platform is therefore rather started with compelling visions towards unpredicted future, 'creating new human experiences (Gawer & Cusumano, 2008).

However, holistic strategic approaches to designing is often confronted with certain proprietary elements due to the nature of buy-and-sell relationship between platform complements in digital platform, and so this causes sensitive challenges in designing right product architectures and the interfaces whilst facilitating the third parties to join a digital platform (Gawer & Cusumano, 2008; Gawer, 2009). For that reason, dilemmatic tensions between design participants in a partnership inevitably occur in the race to achieve platform leadership (Eaton, et al., 2011; Gawer, 2009) such as global disputes over design patents, Samsung vs. Apple in 2011 (Banks, 2012). In this context, a study on organizational approaches to managing design is significant as concerned with the shifted principles and logics of design in new digital product development process. 'Designing' approaches in organizations are rather required of decentralized organizational model for *generativity* of designing in less hierarchical domains (Yoo, et al., 2010; Krippendorff, 2011). Despite that it has been little discussed in design and organization studies. There has been growing interest in expanding design capabilities that embrace the dimension of organization in design studies (Cooper & Junginger, 2013; Junginger, 2008) , yet it has provided little evidence for different approaches to managing 'digital design (i.e. designing)' by organizations.

Studies of organizational culture as the vehicle of understanding different approaches to managing digital design

Organizational cultures have been varyingly studied after an open-natural model encompassed organization-environment in holistic approaches, shifted from conventional rationality-based material organizations (Scott, 1998; McKelvey, 1982). In light of this Smircich (1983) suggested broadly two modes of thoughts on organizational culture studies for the analysis by distinguishing from pure anthropologic cultural studies: organizational cultures discussed *in interdependent variables of material organizational actions*; and *organizational cultures as a root metaphor*. The former one views organizational cultures as part of the environment and a result of human enactment. Organizational culture is thus a kind of variables within a boundary of organizational material actions from an *instrumental perspective*, which is derived from the economic and material practices of organizations. *Cross cultural and comparative perspectives and corporate cultures* are included in this. On the other hand, the later one is organizational culture, which is discussed in *a root metaphor*, referring to an organization as expressive forms of human consciousness. Ideational and symbolic aspects of a concept of organization for human interaction were discussed and so *organization as a set of cognition and organizational symbolism* were introduced.

However, organizational culture studies have much emphasized its material and instrumental aspects. Rousseau (1995) viewed organizational cultures as extents of psychological contract that bounded employees with an organization in organizational setting through a certain exchange agreement. Furthermore, studies on international organizational cultures have been focused on organizations' material practices. Especially, cross cultural studies have been broadly investigated regarding those material aspects: a relationship between different countries' economic development and national cultures and differences of work practices in inherent organizational cultures from national cultures. In particular, studies on organizational cultures in the East and West have been controversially discussed, for instance South Korea, Japan and Taiwan, use 'controlling' organisational language :“large power distance/low individualism/strong uncertainty avoidance/ restraint” ; whereas the Anglo-Saxon dominant Western countries such as the U.S. and U.K., are characterized as 'less-

controlling': “small power distance/high individualism/weak uncertainty avoidance/indulgence” (Hofstede, et al., 2010; Spector, et al., 2001). Accordingly, in management science and marketing studies, influences of different business system have been discussed regarding the success of East Asian organizations in complexity-based electronic industry: Japan, South Korea, and Chinese cultural background countries (Taiwan, Hong Kong, Singapore) (Hobday, 1995; Hobday, et al., 2004). As to electronics industries different strategic approaches to the new product development process in the East Asia and West have been also studied (Song & Parry, 1997; Lee, et al., 2000).

Despite that it has been rarely discussed how approaches to managing digital design can be implicitly or explicitly affected by different organizational cultures from cross cultural perspectives in the digital realm. With focus on this, this study offers key understandings of how approaches to managing digital design can be affected in different organizational cultures by examining Eastern - based and Western-based organizations' new digital product development.

3. Setting the theoretical research framework

To guide this study with better understanding of a relationship between organizational cultures and digital design, we developed a theoretical framework as a part of a case study (Yin, 2009). Each dimension is developed by elaborating organization- environment relations, interdependent cycle in an enacted organization for its material practices: **organizational structure; domain definition; information system, attention structure; enacted environment; objective environment; and the outcomes and output** (Scott, 1998, p.143). With reference to this, we develop four dimensions on new digital product development and organizational cultures: **(1) tangible organisational systems and IT technology tools; (2) factors in decision making in the NPD process (3) reflection of the organisation in the product platform, and; (4) supporting organisational cultures.**



Figure 1. The theoretical research framework developed.

(1) **The ‘tangible organisational systems and representative IT technology tools’** dimension is developed as related to ‘cognitive organizational information system’ in an organizational structure and its domain in a process of structuring its attention to product development. So the cognitive information transferring form can be viewed as bureaucratic ‘*formalisation*’ tools 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 seen as representative formalization tools employed by modern organisation to transfer and leverage members’ knowledge as well as fostering collaborative works in design and NPD practices (Boland, et al., 2007; Akgun, et al., 2006).

(2) The dimension on **‘factors in decision making’** is related to the enacted organizational attention structure and the environment during the new digital product development process. Since any projects in an organisation are considered about complex and political concerns about budget, schedules and technical ability, so attentions structure on an actual NPD is also concerned with risk and uncertainty regarding realities of a project such as financial situation and timeframe (Hollins & Hollins, 1991) as well as design outputs (e.g. product line variation) (Hollins & Hollins, 1991; Karjalainen & Snelders, 2010).

(3) **Reflection of the organisation in the product platform** refers to design outcomes that are resulted from enacted organizational environment before producing ‘output’ such as goods or services as complete ones. Thus ideas of product platform are applied as platform development at an organization represents all significant decision making of an organization with their technological capability for new product design or its derivatives (Ulrich & Eppinger, 2012). Especially in digital design, the term ‘platform’ even refers to ‘*design*’ itself as an embodiment of a whole organizational artefact (Gawer & Cusumano, 2008; Baldwin & Woodard, 2009).

(4) **‘Supporting organisational cultures’** refers to supportive organizational environment in enacted material practices of organizations. Since logic of organization has been addressed in a certain relationship between hierarchical structures of organisations and its material practices (Hofstede, et al., 2010; Mintzberg, 1983), new digital product development can be associated with those organizational attitudes that arise from different hierarchical structures of organizations and the inherent organisational cultures. This could be much distinguished in different organizational cultures especially in the East and the West as considered by prior studies on NPD (e.g., Lee et al., 2000; Song and Parry, 1997).

Each dimension provides key agendas as specific guides for this study. The framework therefore plays a central role to develop an organizational culture mechanism on how managing design is differently approached by organizational cultures in the East and West.

4. Research Setting

This study mainly employed a qualitative research approach with an in-depth interview method. Data were collected in two phases for the best abductive reasoning (Kovács & Spens, 2005): a pilot study and the main study. In the pilot study, the key theoretical framework was tested with the semi-structured email interview (Meho, 2006) as the first phase of case studies (Langrish, 1993), from August 2013 to October 2013. Following this, the main study was conducted with one-to-one in-depth expert interviews: personal meetings; skype calls and emails, ranging from 40 to 120 minutes in length, from March 2014 to September 2014.

In order to gain maximised insights on international design projects in the East and the West interviewees were selected from a range of NPD project-based groups that represent a complex organisational structure and its multiple interactions (Yoo, et al., 2006; Ulrich & Eppinger, 2012). By doing so it can draw maximised analogical reasoning from those representative small-sized sample (Loewenstein, et al., 1999). All participants 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) in a range of new digital product development relevant projects from physical component design-e.g. semi-conductor- and product design projects to intangible content and service design in a global digital ecosystem. The large global corporations’ design projects addressed were representative digital product providers: 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. For best triangulation, interviewees were selected from two groups: external employees (global design and management consultants: pilot study 4; main study 11) and internal employees in out of those 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. For data analysis thematic analysis was employed with processing of transcribing collected data, searching features and extracting the themes

(Braun & Clarke, 2006). The drawn themes were discussed with multiple secondary data sources for robust triangulation (Jick, 1979).

5. Findings

5.1. Different approaches to managing design by large organizations in the East and West

Regarding design outcome and the output ((3) & (5) in Figure 1) we discovered that there are different design priorities in the East and West, and the differences can be related to influences of inherent organizational cultures in the East and West (related to (4) in Figure 1). Firstly, the overall environment of a design unit/group/ department located in a region – the East Asia or the West – is concerned with given social psychological values of a country location. Design units are situated in an environment of the region in new digital product development process. The differences are characterized as **enabling flexibility in the West and coercive inflexibility in the East Asia**, respectively.

Actually the company was the joint venture between Ericson from Sweden and Sony from Japan [...] You will go to the office in Sweden and the environment...is very relaxed...very friendly...people will have coffee break twice a day... If you go to the Tokyo, it was obviously...they will stay super late...like they would leave at 9pm...10pm [...] and there were no social things...two coffee breaks...or not...but...the difference starts [...] It was same as HTC ...HTC was similar situation[...] Obviously, Taiwanese company...they try to work very hard...they...they...are competitive...they have very scrappy team.

When I worked in Sony [...] 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 say "I have to finish this." working through extra hours. And they focus on people kind of pushing forward from duty aspect you know... China is also similar in that way.

Secondly, implicitly different environment of organizations in new digital product development are explicitly reflected in information transferring process where incremental complexity is derived from heterogeneous design elements are overwhelmingly compelling (relating to (1) and (2) in Figure 1). Different manners of information transferring are reflected in cognitive and attitudinal formalization

processes between organizations (e.g. meeting, presentation, reporting, and documentation: design brief, concept generation etc.). The Eastern based organizations are characterised more demanding than the Western ones: analytical, explanatory, numeric, predictable, measurable and quantitative details in addressing reasoning for those formalised process; whereas exploratory, blunt, or conceptual ideas are acceptable in the Western based organizations.

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.

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.

Lastly, the different manners in the formalization process are associated with different characteristics of a cognitive and attitudinal relationship between authorities in a decision making process and information transferring actors' status in the East and West. We found that higher demanding formalisation in the Eastern Asian organizations is caused by the tight-coupled organization structure as well as their different concepts of attitudinal hierarchies.

They much tend to ask for much more rational explanations, comparing to Western-based companies [...] Because they need to convince other people in their company. At 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..

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.

With those focus of this, we discovered that design priorities in the East and West likely differ in international design projects in competitive digital landscapes: the Eastern organizations focus on tangible materials aimed at 'design output'; whilst Western organisations adopt an immaterial and exploratory process towards 'design outcomes'(relating (3) in Figure 1) (summarised in Table 1).

Categories: () Dimension of the theoretical framework		The East	The West
Organizational manners about design practices in Offices: (4)		<ul style="list-style-type: none"> •Competitive/Snappy action •Dutiful •Tight-scheduled •One-Way Push/ Coercive •Inflexibility-driven 	<ul style="list-style-type: none"> •Relatively relaxed & Indulgent •Rather two way/ Communicative •Flexibility/Enabling acceptable
Formalization process : (1) and (2)	Cognitive information transferring : (1)	<ul style="list-style-type: none"> •Relatively demanding across design process with formalization: visualisation, documentation, reporting etc. •Quantity prioritised: Analytical, Prominently Explanatory, Numeric, and Rationality - based details required •Formalization for formalization itself for supervision 	<ul style="list-style-type: none"> •Less demanding in formalization •If an idea is qualified, Blunt, Explorative, little Numeric details acceptable •Formalization for effective communication between participants
	Attitudinal and behavioural areas: (2)	<ul style="list-style-type: none"> •Formal •Prioritised hierarchy •Clear boundary between speakers and recipients in discussion •Thoughtful and structured 	<ul style="list-style-type: none"> •Casual or rather relaxed •Less concerned with hierarchy •Obscure boundary between speakers and recipients in discussion •Blunt and exploratory
Design Priorities: (3) and (5)		<ul style="list-style-type: none"> •Adding features/material outcomes prioritised •Complexity is better •Explanatory design concepts •Prominent visual preferred •Tangible outcomes in framing towards an output/result 	<ul style="list-style-type: none"> •Immaterial outcomes acceptable •Simpler is better •Exploratory design concept •Conceptual outcomes in exploratory process acceptable •All design outcomes regarded as parts of process towards problems-solving

Table 1. Different organizational manners in the East and West and Design Priorities in New Digital Product Development

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.

In case of Samsung and LG, they are kinds of global companies. [...] 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!

5.2. Development of an interdependence cycle of organizational cultures in new digital product development

5.2.1. Fundamental concepts of organizational cultures in digital design as Purposeful Material Results

We uncovered more specific mechanisms on how the differences of design priorities are drawn in the East and West, by elaborating an interdependent cycle of organizational cultures. First of all, with regards to supporting organizational cultures (relating to (4) in Figure 1), findings from this study indicate that concepts of organizational cultures in digital design practices are characterised as instrumental results of purposeful material practices of organizations (i.e. cross cultural and corporate cultures). Despite the increasing significances of human centric elements in designing, it is hardly discussed in metaphoric concepts of organizational cultures emphasizing human interaction

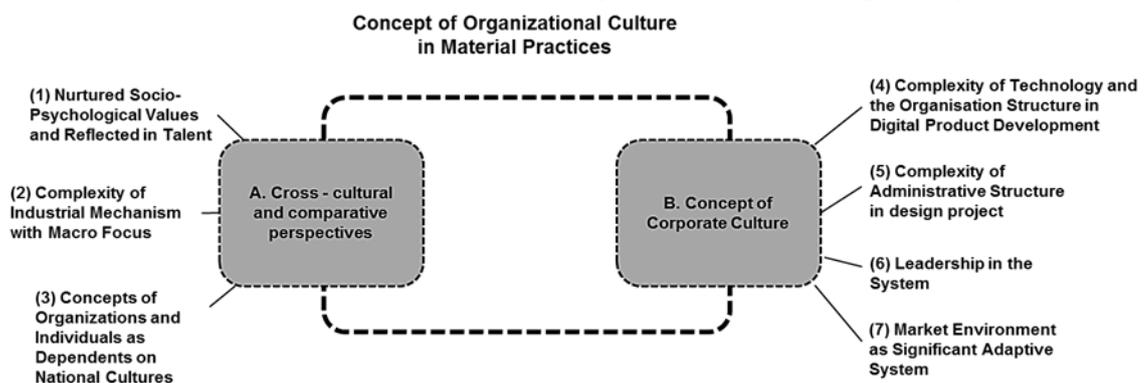


Figure 2. Concepts of organizational cultures and the drawn concerning factors in digital design

in itself (Fig. 2 and see also Sec. 2). This can offer significant implications that can offer specific explanations about how supporting organizational cultures in the East and West affect design outcomes and output.

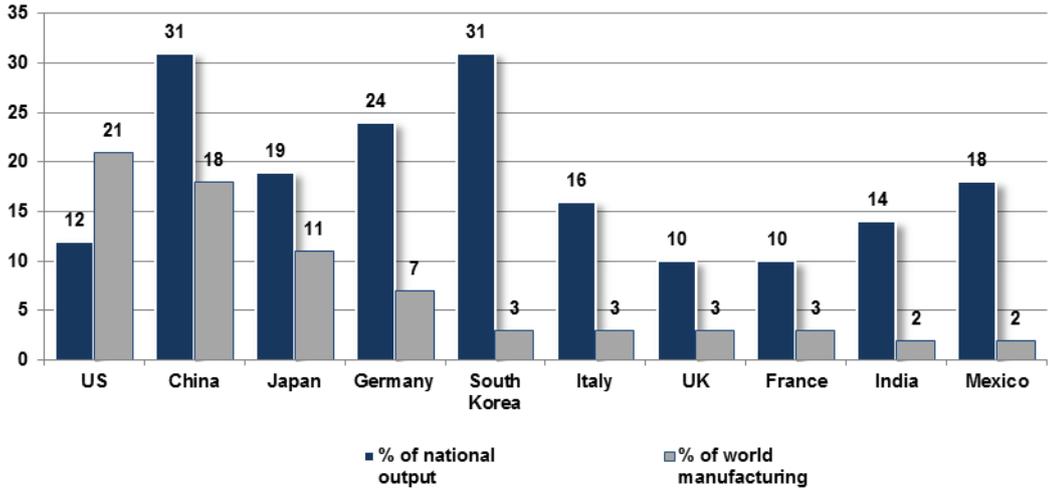
Firstly, in cross-cultural concepts ('A' in Fig. 2), different organizational cultures are likely inherited from different industrial mechanisms between nations in alignment with national economic growth and also reflected in required professional members' talents in accomplishing a certain material outcome((2) in Figure 2). Especially, different perception of design practice in the East and the West is closely related to different time of industrialization and different speed of economic progress as related to their new technology development progress (see also Kao, 2009; Hobday, 1995). Major differences of the material practices related to design in the East is their industrial progress that has heavily relies on manufacturing for efficient economic development in short time (Fig. 3).

We have to understand that you have been in that context in the time. So, because things are moving really fast [...] To 10 years of China or Japan, or Korea, but...because we are moving so fast, compared to right now?

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.

Specifically digital design and its industrial mechanism make the differences much clearer in processing of forming a digital platform (discussing (2) in Fig. 2). Despite significances of unity of heterogeneous firms' function for an ecosystem the leading East Asian market, including China, Korea and Japan, is seen as a more closed ecosystem in itself when looking at their tangible supportive systems and those cultures, such as a degree of risk aversion in financial and governmental policy, of information openness and of opportunity perception from different market. Those can be proved in breakdown of global entrepreneur index that provides a country's detailed industry ecosystem (Ács, et al., 2015 and Fig. 4)

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



% Total manufacturing value added from 1970 to 2010 by nations (Mellows-Facer & Maer, 2012)

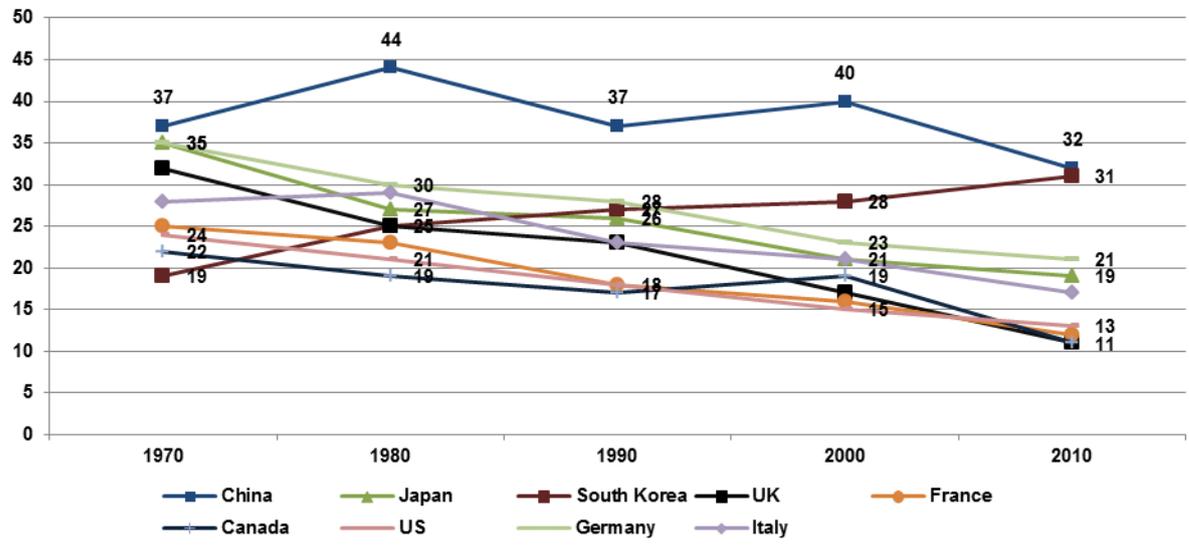


Figure 3. the world Top 10 Manufacturing output countries' % of national output and % of world manufacturing (Rhodes, 2014)

they will be ok not to care about other market.

Particularly, in China information and knowledge are very harder to combine. That's the very high priority. They cannot easily get the knowledge because the communication is more closely controlled by government with limited access to different website.

Next, cross-cultural differences are also found in different perceptions of a relationship between an organization and individual members (discussing (1) and (3) in Fig. 2). The inherent patterns are associated with a country's nurtured socio-psychological values that are reflected in collective members' attitudes in an organization.

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

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 show more respect? More polite? But over here in Europe, you tend to be a client, but the thing that is kind of we are "I know we are in business!" partner!

Differently shared concepts of the value systems in the East and West can affect a process of achieving design outcomes as collective sentiments of members can intervene in organizations' purposeful material practice.

Following this, individual corporate cultures are also conceptualised as interdependent variables in material organizational cultures (B in Fig. 2). Its adaptive mechanism is interplayed with given national circumstances to produce a certain type of goods or services. The adaptive mechanism represents required complex technology for a new product, configuring organization structure for complex technological and material mechanism of an organization (Discussing (4) and (5) in Fig. 2).

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.

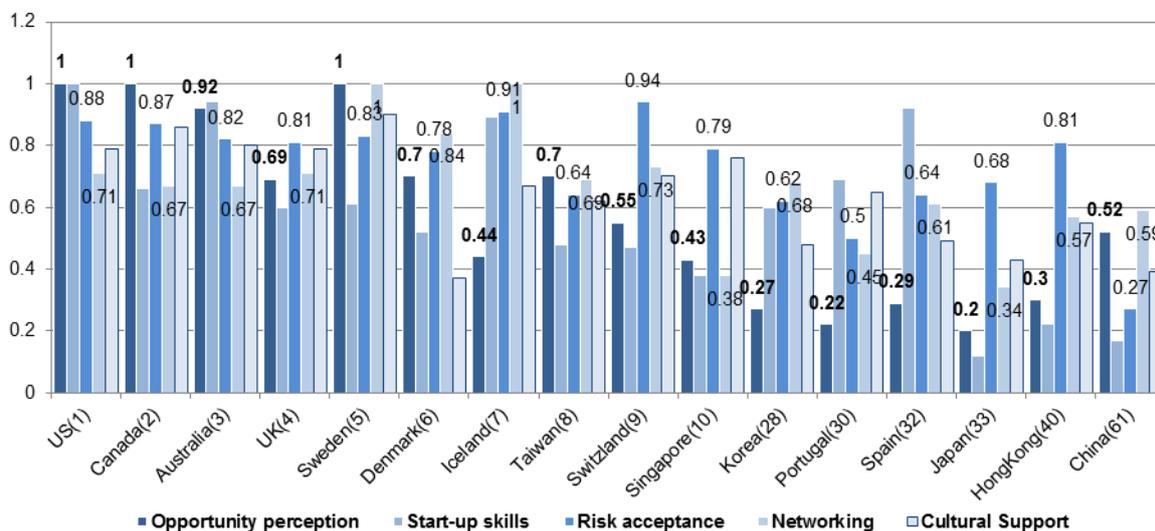
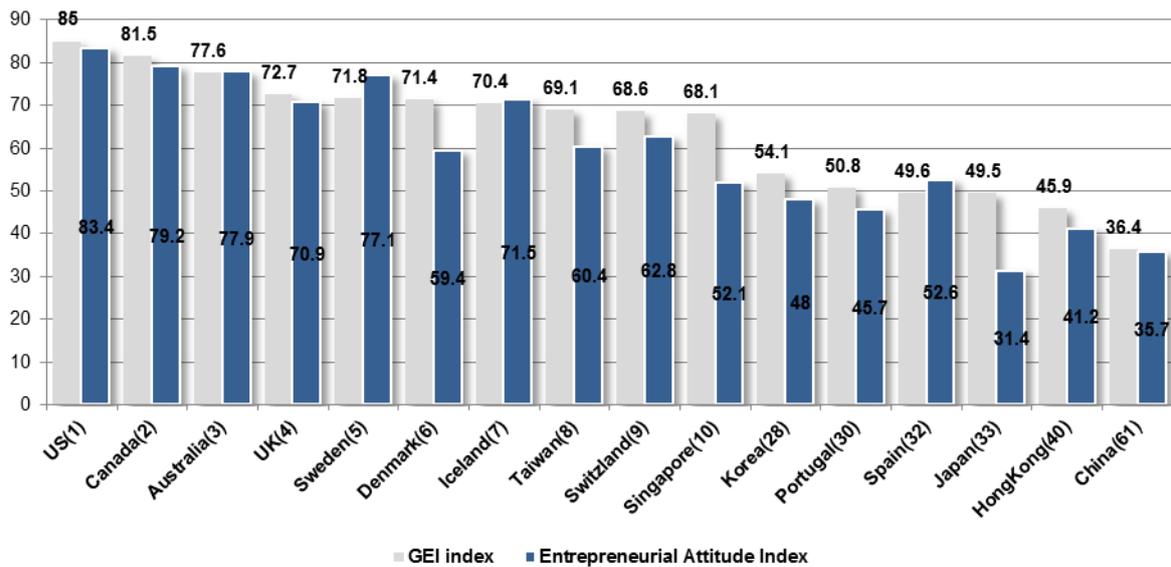


Figure 4. Entrepreneurship Attitude Pillars in Global Entrepreneurship Index, () referring to global rank (Ács, et al., 2015)

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.

Following this, in order to cope with those complexities of material objects (i.e. product and organization), a leadership of an organization is likely coupled with those organizations' material mechanisms and its cultures (see also Tsui, 2006). This is interacted by a given competitive environment – technology and market – for their best material performance (Discussing (6) & (7) in Fig. 2). For that reason in the East strong leadership is likely to be characterized as much autocrat or tyranny style due to their psychological pressures that imposes to leaders' sentiments in competitive digital environments.

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.

They kind of go wrong because the person who is in head takes blame for everything. Because he is a leader [...]. One good experience, 'Chubachi (Ryoji Chubachi at Sony)' stepped down as a...from subsidiary CEO of Sony.

5.2.2. Digital design in Enacted Material Organizational Cultures

Based on understanding of material organizational cultures, we reveal a mechanism of organizational culture that implicitly affects approaches to managing digital design (relating to (1) and (2) in Figure 1). Organizational cultures in new digital product development become likely discerned from others in accordance with an enacted organizational culture cycle consisting of three major dimensions: **(1) organizations' domain definitions – hard and soft;** **(2) organization structures: normative and behavioural structure;** and **(3) organizational**

attitudes towards perceptual variables in attention structures (To present in Fig. 5).

(1) Organizations' domain definitions – Hard and Soft

In new digital product development there are clear boundaries of large organizations' domain definitions that are significantly interacted with an inherent given organization's goal and characteristics: Hardware and Software. The Eastern based organizations has been relatively developed in hardware domains, whereas the West has become established in software like ground. Approaches to managing design in digital design are thus likely operated within an each given domain boundary in integrating heterogeneous digital design elements into a digital platform (Table 2).

Technical credit culture in Japan, Korea...and China to certain extend as well. Well you have incredibly intelligent rational thinking engineers [...] And so, a lot of it simply that power structure [...]. Collective decision making...is supposed to be rational, but it's actually political.

Sony and HTC, they make money when they sell devices. So the software is...something that adds value to hardware...Whereas Google...we don't make money when selling devices. We make money by services we offer, and the number of people uses that services.

It infers that an early organization's domain definition can affect subsequently following digital design processes, since a company has been already nurtured based on logics of their original domain definition (Presenting (A) in Fig. 5).

(2) Organization structures: normative and behavioural structure

Given that domains subsequently affect large organization structures featured in two levels: normative structure - perceptual and formal structure; behavioural structure - informal and member's sentiment representing power structure and the members' socio-metric structure (Presenting (B) in Fig. 5; see also Scott, 1998).

Firstly, a normative structure in a large organization is

	Hardware-like	Software-like
Design methodology focused on	<ul style="list-style-type: none"> • Measurable material output • Concerning about deviances to be able to be expected or unexpected with technical measurement 	<ul style="list-style-type: none"> • Unpredictable human behaviour • solving unpredictable, immeasurable and fuzzy problems that arise from highly customised user's demands
A design professional are characterised	<ul style="list-style-type: none"> • A part of collective set relying on serial powers • Reductive actions focused within a standardised design process 	<ul style="list-style-type: none"> • Pursuit of holistic approach to embrace all unpredictable deviances based on own logic (yet it is not always applicable in case of considering hardware design)
Integrating heterogeneous design elements into one digital artefact infers...	<ul style="list-style-type: none"> • Administrative like approach to managing design in integration adding-up on most optimized existing elements in a sense of marginal economy 	<ul style="list-style-type: none"> • Loosely coupled organization is allowed to embrace tight coupled elements in achieving a holistic product design as a whole

Table 2. Domain Definitions in New Digital Product Development and the Organizational Contexts

likely inherited from its own domain definition. It is important to understand different characteristics of domain definitions between hardware and software (Table 2). Due to the different approaches to design between two domains, an inherent normative organization structure is however seen as different types of challenges in new digital product development (Table 3). This determines whether an inherent organization structure is approached in reductive or holistic ways for digital design (Presenting (b) in Fig. 5).

It is pyramid for instance...Sony, But it's not...it is not perfect pyramid. It's ...it's more like serial pyramid...So, Sony Ericson was pyramid and....Sony computer entertainment was different pyramid. There will be a moment ...were...it's difficult to ...take all the strength of all the different division and combine to one product.

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.

Next, we found differences of behavioural structures in the Eastern and Western based organizations. This is seen as informal power structures amongst relevant design units and individual members, which cause another attitudinal and behavioural hierarchy in an organization. This affects members sentiments that are attracted to their own design practices at their organization as well as actual decision making processes in new digital product development process (Presenting (b`) in Fig. 5).

It (the decision) can be made by middle level. [...] 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.

There is still limitation in Korean organizations... That is very negative in effect. If a project carries on, despite an executive member's opponent, it is meant for the sack. 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! Fingering by the superior!

Key inferences derived from enacted organization structure is summarized as a dilemmatic relationship between given perceivable organizational structures constrained by given domain structures and implicit attitudinal structures representing informal power structure (Summarised in Table 3)

(3) Perceptual variables in attention structures

As to actual attention structures in NPD process (discussing (1) &(2) in Figure 1; see also Table 1), firstly, in complicated new digital product development process cognitive corporate information transferring tools (e.g. information technology communication tools) across normative organization structure are shown its limitations to completely convey requiring tacit and implicit knowledge. The information delivered is not unlikely explicit and exploited knowledge.

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!!

Probably not. 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 conferenceyou skype somebody ..text somebody...they are just simply tool...to communicate

It infers the more product design process is complicated for its complex system the more tacit and implicit knowledge exchanging is required in order to deliver in-depth knowledge to accomplish integration of heterogeneous design elements in organizational

Organization structures featured by given domain definitions are likely characterised...	
In Hardware - like domain	In Software -like Domain
<ul style="list-style-type: none"> • Normative structure is somehow fixed to tightening reductive member's role • Configuration and reconfiguration of structure takes cost 	<ul style="list-style-type: none"> • Normative structure is loosely coupled to respond to changing problematic circumstances • Configuration and reconfiguration is flexible up to professionals' specialties
<ul style="list-style-type: none"> • Behavioural structure seen as complex due to multiple attitudinal informal power structure linking reductive roles and authorities: sometimes the power structure is decoupled from normative structure due to the attitudinal complexities • Professional members' sentiment is rather likely focused on individual security in their own status 	<ul style="list-style-type: none"> • Behavioural structure is likely to be coupled with normative structure due to a professional's a breadth of role coverage • Professional members' sentiment is rather prioritised in their professions

Table 3. Organization structures featured in given domain definitions

attention structure. It also means that during that process organizational attention structure could not be necessarily carried out in rational ways (Presenting (B)-(C) in Fig. 5).

In this context, we discovered that organizations' new digital product development reflected their concerns differently by their given perceptual capabilities that can deal with their emergent risks or uncertainties during development process. These are represented by the given perceptual controlling factors for new product development: allocated recourses concerned with spent cost and limited timeline for launching new products (discussing (2) in Figure 1; presenting(c) in Fig. 5).

It is 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 is significant cost.

One project goes seven months because I've done one design, and something else[...] what we need to do is we need to have kind of half people were placed in make quick and tactical and multiple decisions.

Those tend to manifest design outcomes differently in a process of delivering design outputs. Provided a timeline for a design project and requiring product line variations are the indicators. Higher concerns on their perceptual controlling factors likely result in tight timeline and requiring a wide range of product line variations in order to minimise its precedent risks

(presenting(c`)) in Fig. 5).

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

When they(the Korean clients) outsource a service design project, the timeframe is usually given only one or two months, or maximum three months.

In this context, the concerns on an organization's perceptual controlling factors are closely related to its early domain definition (i.e. hardware or software). The levels of concerns on given perceptual controlling factors are different by domain definitions and so perceptions to risks or uncertainty are determined by those given concerns. Despite significance of generative process of designing, organizations are hardly separated from the issues of given perceptual controlling factors. Development of hardware product devices is rather concerned with all relevant manufacturing cost and its precedent deviations between necessary components and product architecture. Hardware organizations thus tend to pay attention to all those perceptual controlling factors.

The owner of the project, the general manager is that hardware owner [...] Now, software general manager report to consider the hardware general managerso...it's to do with the fact that 'cost'

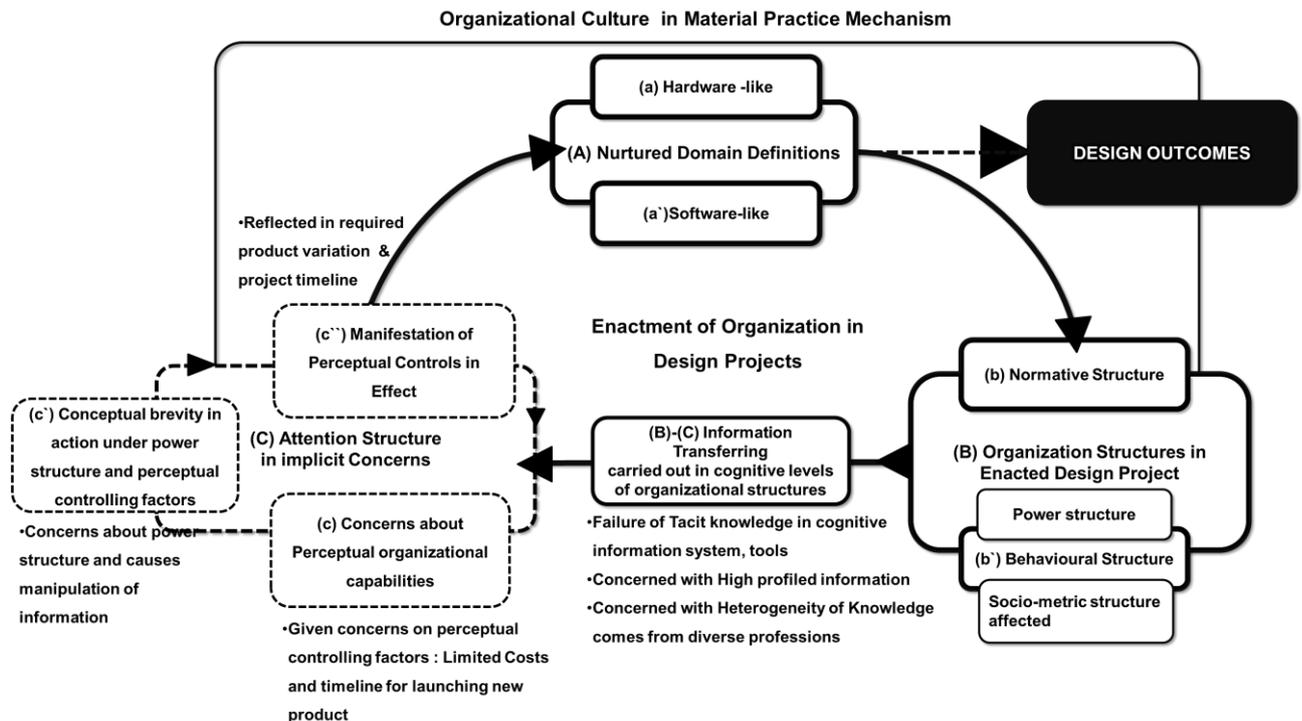


Figure 5. The interdependent cycle of organizational cultures and approaching to managing design in new digital product development project

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.

This is balance internally profitability...which you make a profit more. If you have only a memory stick (for) Sony camera so people buy memory stick so...the company makes money for it. If SD is more popular obviously people don't buy this.

Lastly, the aforementioned are reflected in ways of conceptualising brevities of key decision makers. Conceptual brevities presented by key decision makers in decision making process are rather situated in certain dominant power structure (presenting (c') in Fig. 5).

Sometimes, depending on situation, a deputy manager can be right [...]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 is little respect to the differences in Korean companies.

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.

Overall, in comparison with the Western-based organizations, the Eastern - based organizations are relatively featured in complicated attention structures situated in tight coupled and vertically integrated hierarchical organization structure in alignment with their given domain definitions – i.e. hardware.

6. Reflection

This study offers key implications. Different design priorities and the approaches to managing design by different organizational cultures can be associated with different perceptions towards uncertainty or risks due to an organization's inherent perceptual capabilities from their domains. Because ill-structured digital product development domains are concerned with 'openness' embracing 'heterogeneity' in holistic approaches (i.e. designing for generativity). It can be clarified by looking at the different organizational contexts in the East and West from the perspectives of material organizational cultures.

Cascaded domain definitions from national material environments

Firstly, the different patterns of approaching to material practices in the East and West (presented Table 1) are associated with different times and speeds of early

industrialization that are aligned with their economy growth with their organizations (see Fig. 2). Since design capabilities on complex product development – digital product design- are to certain extent supported by organizations' technology capabilities that represent the level of economic achievement such as R&D capacity, the national grounding is the key issue for an individual organization to absorb their own capacity, such as supporting governmental and capital systems, policy, research infrastructures and the human resources and so on (Tellis, et al., 2009; Kao, 2009). In comparison with the Western-based organizations' approaches, the Eastern Asian organizations had to chase the Western ways due to their late start in the market. So raising talents for attaining better manufacturing skill and the know-how are the key issues for their fast growing with massive investment on manufacturing that are vertically constructed- i.e. Hardware domain ((A) in Fig. 5). Their nurturing social psychological value system such as granted collectivism and higher power distance learnt from their early social value system could have played a central role for them to grow quickly in terms of nominal growth. This contributes to achieving sizable economic growth alongside incrementally accumulated technological knowledge. Because this can effectively collect incremental human power for absorbing incremental technological and practice based 'know-how' through keeping abreast of new design capacity (see also Sanchez & Manhoney, 1996 and Cohen & Levinthal., 1990, pp 140- 141). Those however show limitations because collective rationales run by a few powerful authorities can cause competitively coupled knowledge tensions between members in generating new knowledge.

Different approaches to managing design by a given design methodology in an inherent domain

Early domain definitions of the Eastern and of the Western large organizations are resulted in likely different types of organizational structures (i.e. normative structure) aligning with own domains' approaches to managing design ((A) & (B) in Fig. 5): hardware manufacturing in the East and software system in the West. The early domain structures has been already aligned with its dominant logic and methodology towards design practices such as soft system or hard system (see also Checkland & Scholes, 2007; Broadbent, 2003). It is imperative for hardware electronic device manufacturers to much concern about objective, measurable, predictable, accountable, explanatory and structured reasoning for dealing with their tangible mechanical and electronic design outputs; whereas software originated organizations necessarily call for exploratory approaches to building their system through loosely coupled structures (Fig. 3 & 4; see also Sanchez & Manhoney, 1996; Broadbent, 2003; Yoo, et al., 2010). It offers key understandings of how the Eastern based organizations likely prioritize rather complexity driven outputs (drawn in Fig.1).

Conflicts in enactment of design practices: risks

controlling and uncertainty designing

Emergent issues here are paradoxical tensions on shifting environment of design practices in digital design situated in 'designing' across different domains and organizational approaches to managing design, which are absorbed as organizational cultures. Those issues are encapsulated regarding different perceptions towards between risks and uncertainty that 'designing' actions conceive under a certain power structure of organization.

In terms of absorbed design capacity through a domain and that organization structure, accordingly, behavioral structure of an organization is another dilemma reflected in informal power structure and design professional members' socio-metric structure in key decision making process. In the Eastern based organizations, collectivists and higher power distance significantly likely form another layer of informal power structure in behavioral structure and its attention structure. For manufacturing underlined in collective rationality, although the Eastern Asian cultures - collectivism and higher power distances- could contribute to intrinsic collaboration based on leader's internal empathy towards their actions it can be challenged in multiple complexities overwhelmed digital design conditions where truly participatory and collaborative actions are required in long term perspectives (see Davis, et al., 1997; Sundaramurthy & Lewis, 2003). This can cause vicious political maneuvering. As the performance becomes more successful collective censorship and strong supervision in attention structure is much expected with measurable and predictable outcomes and outputs for securing its power structure, so that it turns out to be as collective

tensions in reductionist manners. This model is likely to be challenged to embrace 'uncertainty' that emerge from heterogeneity in new digital product development. Thus all design practices and outcomes must be the ones taken perceivable 'risk' in management of design. Whereas the figured Western based organizations, pure control and governance for given material practices likely arise from the individual leader's vision. So it can encourage individual design professionals' solidarity towards their own professions. Since software domains in the West were not necessarily coupled with their national environments such as historical and social development progress organizational approach to known and unknown problems for designing can take place by separating from organizational political manipulation. Organizational structures can be thus relatively configured for optimizing their product and service's design inquiries in an environment featured in individualist and small power distances. So that extrinsic motivation and individual's opportunism (Sundaramurthy & Lewis, 2003) are more useful to embrace heterogeneity of complexity of digital product development if an organization's goal meets an individual member's opportunism. However, in this circumstance it is important to match an individual professional's extrinsic motivation with an organization's goal through their design practices. Otherwise the practices are placed in indulgent, fuzzy and unstructured manners from individuals' attitudes to organizational level.

Suggestions of scenarios in the East and West

This study suggest two major scenarios that represent

Domains	Given organizational capabilities concerned with	Design Capability is reflected	Conceptual brevity reflects...	Absorbed design capacity
The East : Hardware	<ul style="list-style-type: none"> Inputs in managing design perceived as cost - direct and indirect cost, so timeline is concerned Concerned with new <i>featuritis</i> product Managing design addressed in tactical level from short term perfectives in response to existing market & technology 	<ul style="list-style-type: none"> Tangible product variations in tactical level, and so focused on launching a design output Professional members concern about explanatory rationales for doing-actions based on perceptual evidences 	<ul style="list-style-type: none"> Quantified, mathematical and numerical evidence expected to reduce deviances Due to eminent informal power structure design professionals are disturbed by political manoeuvring To cause scarce attention to unmeasurable, unquantifiable uncertainty 	Assembly & Fabrication :In Management of Design for making objects
	<i>Organizational Language used towards Design Outcomes as 'Controlling'</i>			
The West : Software	<ul style="list-style-type: none"> Inputs in managing design as investment due to nature of software design Unprecedented problems are always underlined Managing design addressed in strategic level from long term perfectives due to uncertain problematic situations 	<ul style="list-style-type: none"> Diversification is not necessarily for tangible goods, and so the focus is on concurrently occurred problems of a product as a whole Professional members consider about exploratory process to account for fundamental logic 	<ul style="list-style-type: none"> Brevity is rather qualified based on universal logic Loose power structure plays as a guidance or supervision, so design professionals are allowed to dedicate own profession To concern about lack of controlling due to loose coupled power structure and opportunism 	Reflective actions :In Design of Management for Designing
	<i>Organizational Language used towards Design Outcomes as 'Interactive' enabling</i>			

Figure 6. Scenarios in organisational approaches to managing design in the East and the West in the digital realm

key differences of design management in Eastern and Western based organizational cultures regarding new digital product development (Fig. 6). In the Eastern-based organizations like Samsung from Korea and Sony from Japan, since the organizations are situated in hardware domains in their single hierarchical - national culture grounds, so that approaches to managing design for their design outcomes are characterised as **controlling** aspects governed by a certain organizational power web. The model is better dealt with precedent risks and homogeneous elements for single hierarchical artefacts featured in visceral and behavioural design. This can be dealt with by practical knowledge for the best-functioned and featured product (i.e. featuritis¹). For that reason, **assembling** or **fabricating** design capacities are likely to be optimised within a boundary of homogeneous extents of design practices (i.e. design participants: organizations and professionals, extents of product definitions. Thus design is rather managed as making an object: **Management of Design**. On the other hand, the Western-based organizations' approaches to managing design such as Google are featured in rather **interactive** ways that can raise issues on unprecedented uncertainties in a process of design inquiry. This is because those organizations' early domain definitions allow loosely coupled organizational structures and also those national cultures are moderately allowed those enabling interaction (i.e. individualism and less power distances). Since design inquiries tend to come from their leaders' empathy towards their digital artefacts an organizational design capacity can be optimized to solve significant complexity in multiple heterogeneous of a digital product. The design capacity is thus featured in **reflective** actions based on 'know-what' knowledge. In this circumstance, approaches to managing design come closer to **design of management** for designing.

7. Conclusion

In conclusion, the success of new digital product development is associated with how an organizational culture perceives 'risk' or 'uncertainty' to capture new opportunities in designing. However, different ways of dealing with perceivable risks or unprecedented uncertainty are to some extent nurtured through cultural grounding on material practices reflected in organizations as well as its national ground.

Despite the significance of designing in the digital realm, actual organizational approaches to managing design is thus rather situated in ambidexterity that cope with both certainty and uncertainty. This can be featured in a cycle of an early domain definition,

¹ Dornald A. Norman(2013) raises this issue in his book *The Design of Everyday Things*. As product follows all design principles and the product is successfully sold by customers it makes the company push towards the additional new features in order to compete in market and the increasing demand.

configuration of the organization structure and the attention structure. Implicitly conceived organizational attitudes can be explicitly distinguished in complex digital design conditions, and approaches to managing design can be examined with the organizational culture mechanism (i.e. an enacted organizational culture cycle in material organizational cultures) in digital material practices.

This study is aimed neither to suggest clear boundaries of organizational cultures in the East and West, nor to clarify their different design approaches that might be applied to each other for one side's better design practices. Yet, with focus of that, it rather provides the reader with a deeper understanding of how holistic design approaches (i.e. designing) are challenged in actual digital landscapes and organizations. It also aims to contribute to the expanding area of design-driven innovation studies to discussion of how 'design' can play a central role in the overall creative process of organizations, whilst considering the implicit organizational contexts as well as shifting concept of design.

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