Design Management Absorption in SMEs with Little or No Prior Design Experience

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Declaration of Authorship

I, Claudia Acklin, do hereby certify that this thesis is wholly and completely my own and that I have indicated all the sources (printed, electronic, empirical, etc.) that I have consulted. Any sections quoted from these sources are clearly indicated in quotation marks or are otherwise so declared. Although the action research project, which constitutes the empirical foundation of this project, has been a collaborative effort of different stakeholders, all the parts of this thesis are wholly and completely my own. Furthermore, it has not been submitted for the award of a higher degree elsewhere.
Signed:

Berne, March 2013

Abstract

This thesis studies, how eight SMEs with little or no design experience absorb new design management knowledge, *how* they build design management capabilities during innovation processes, and how able or unable they are to turn potential into realised absorptive capacity. Furthermore, this thesis investigates, *why* some SMEs absorb design knowledge more easily than others. – To answer these questions the literature review explores several building blocks from strategic management, innovation, and organisational studies, and connects them to design and design management studies to understand this fundamentally interdisciplinary topic.

The empirical foundation of this thesis is an action research project conducted with eight SMEs in Switzerland from different trades. During cooperation with the author of this thesis and through collaboration with external designers, different design and design management approaches and tools were introduced to support the absorption of new knowledge. Individual company projects were facilitated from the formulation of an innovation hypothesis to the launch of new offerings. The data from over 80 workshops was analysed using a critical framework, the Design Management Absorption Model to evaluate the progression of absorption of new design management knowledge. The model suggests that absorption processes unfold in steps of acquisition, assimilation, transformation and exploitation of design management knowledge – and if successful – yield internal as well as external outcomes.

It was concluded that there are three different types of companies with respect to design management knowledge absorption, some that reject design after initial attempts due to limited resources or differences in culture and value systems, some that make a basic use of design to improve their offerings but do not fully integrate the knowledge design management knowledge, and some that adopt design and design management to an extent that it starts to act as a dynamic capability enhancing a company's strategic flexibility. The three types have different perceptions of how far they have progressed with respect to their knowledge absorption causing an absorption gap.

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Table of Abbreviations

SME	Small and Medium-sized Company
B2B	Business to Business
B2C	Business to Customer
EO	Entrepreneurial Orientation
DC	Dynamic Capabilities
RBV	Resource-based View
VRIN	valuable, rare, imperfectly imitable and imperfectly substitutable resources
NPD	New Product Development Process
OD	Organisational Development
OL	Organisational Learning
OI	Open Innovation
APAC	Absorptive Capacity
PACAP	Potential Absorptive Capacity
RACAP	Realised Absorptive Capacity
DMI	Design Management Institute (Boston)
UCD	User centred design
NRP	New regional policy (Neue Regionalpolitik)
USP	Unique selling proposition
SDT	Swiss Design Transfer
VIPP	Value, Image, Process and Production
EBD	Experience-based Design
NHS	National Health Service
DMAM	Design Management Absorption Model
OEM	Original Equipment Manufacturer
CX	Customer Experience

1 Introduction

In Switzerland like anywhere else in Europe SMEs exist in a large number and an equally broad variety of forms. Most SMEs share some characteristics: On the one hand, they do not have the resources to deploy design management through a separate function and often don't include designers into their product development processes, let alone innovate continuously (Cox, 2005). On the other hand, compared to large organisations, SMEs are more agile (Fueglistaller, 2004) and able to use design and design management as a lever because they can integrate it more flexibly.

Product development processes in SMEs can even become an "engine of renewal" (Danneels, 2002) and changes quickly visible to customers or other stakeholders. The necessary prerequisite, though, is their willingness to absorb new knowledge and to deploy it throughout their companies (Cohen & Levinthal, 1989).

In 2006, to understand the current practice of design management in Swiss companies a survey with the members of several Swiss design associations and interviews with experts on the state of the art of design management in companies was conducted (Acklin, Stalder, & Wolf, 2006). The survey and expert interviews revealed that design gets managed – how else could it be – but this activity was not named design management. At that time, many Swiss companies were a perfect example of silent design management.

However, amongst scholars (Bruce, Cooper, & Vasquez, 1999; Kotler & Rath, 1984; Moultrie, Clarkson, & Probert, 2007) it is undisputed that the professional management of design activities yields better results than the arbitrary use of design (and designers) on an ad hoc basis. Further applied research of the author of this thesis (details see Chapter 1.3) revealed that some companies were more able than others to put new design knowledge to work. These companies made adjustments to their product development processes by including designers into them and used design approaches in later projects. Other SMEs dropped out of projects or shelved them after the end of the cooperation with the author of this thesis. – *What were the reasons for the difference in absorbing new design management knowledge? To answer this question became the central objective of this thesis.*

For this purpose an action research project was conducted facilitating knowledge absorption in eight companies' innovation projects in a design-driven manner[1]. These projects[2] started with assessing the current impulses from companies' ecosystem and formulating preliminary innovation hypotheses, developing research plans, undertaking appropriate design research and analysis of the data, formulating design briefs, selecting

[1] Definition of design-driven innovation see p. 89
[2] They ranged from the development of completely new products, to incremental changes of existing products; to introducing services and new customer touch points for investment goods.

designers, going through concept development and developing the necessary internal and external processes to launch the new product, service or customer experience. All these steps were facilitated through *design (management) approaches* and *tools*.

1.1 Objectives, research questions and gap in knowledge

Over the last years, design support and promotion programmes, universities, or designers approached SMEs to study them or to introduce design and design management as a strategic resource. So there already exist various models that offer a way to assess design or design management maturity of SMEs (Kootstra, 2009; National Agency for Enterprise and Housing, 2003). *However, how exactly SMEs absorb new design management knowledge, how they embed design as a result of an absorption process, develop more strategic flexibility and dynamic capability as a result of it is under investigated.*

So this thesis studies *how* SMEs with little or no design experience absorb new design management knowledge, *how* they build design capabilities during development processes, and *how* able or unable they are to turn the design management knowledge into improved products, services, appearances, experiences, and organisational renewal. Furthermore, this thesis aims at answering the questions *why* do some SMEs with little or no prior design experience absorb design knowledge more easily than others?

In detail the five research questions under investigation are:

- What internal and/or external impulses trigger the absorption process of new design and design management knowledge?
- What outcomes do the absorption of design and design management knowledge and the build up of design capabilities yield?
- Which specific design management and leadership capabilities are developed during the absorption of new design knowledge?
- Are there specific barriers to the design management absorption process?
- Are there enablers that foster smooth design management absorption?

To answer these questions, this thesis provides a framework to assess design management absorption progression: The *Design Management Absorption Model (DMAM)* builds on the absorptive capacity construct (Cohen & Levinthal, 1990; Zahra & George, 2002) from the innovation studies adapting it to the needs of design management concepts. According to the model design management knowledge absorption unfolds in discrete steps of *acquisition*, *assimilation*, *transformation*, and *exploitation* of new design knowledge. The progression of absorption can be measured with the help of *indicators* that are specific for design management.

The theoretical foundations of the framework are developed through an interdisciplinary literature review shedding light on such a complex phenomenon as

design management knowledge absorption during (design-driven) innovation projects. Since studying design management capabilities in the making is a time-consuming endeavour – over 80 workshops were conducted – eight companies from different trade and with different backgrounds and previous knowledge with respect to design have been studied so far.

We hope that the model will be of use for design scholars, practitioners as well as the design support community to steer absorption processes more effectively in the future.

1.2 Structure of thesis

This thesis consists of a *literature review* (Chapters 2, 3, 4), a chapter on *methodology and techniques of data collection and analysis* (Chapter 5), the *data analysis* (Chapter 6, Results; Chapter 7, Discussion) of the actual action research project, and a Chapter on the *contributions* of this thesis to knowledge and practice (Chapter 8, Conclusions).

The literature review gives an overview over four major building blocks from organisational, strategic management, and innovation studies (Chapter 2); these building blocks were chosen to understand the overarching theme of this thesis. The literature review also includes one chapter on the characteristics and orientation of SMEs (Chapter 3) and of one chapter named *Responses* (Chapter 4) connecting the above-mentioned building blocks to selected topics of the design (management) studies.

The last Response (Chapter 4.4.2) introduces a *critical framework,* the Design Management Absorption Model (DMAM) with the *evaluation categories* of triggers, acquisition, assimilation, socialisation, transformation, exploitation, and outcomes of design management knowledge absorption; in addition, the five *research questions* stated above underpin the analysis of company projects through single case studies and a cross-case comparison.

Chapter 5 describes the *action research methodology* used and the scope, stakeholders, context, etc. of the empirical project. The project itself was split in two parts: During the first part, the author of this thesis *introduced design management knowledge* during innovation projects. During the second part, the process of *absorbing new design knowledge* and the outcomes were evaluated together with the companies.

In Chapter 6 (Results) the data of eight individual case studies is analysed with respect to the progression of design management absorption and the effects of the use of this new knowledge on outcomes, the company's organisational capabilities and resource base. A cross-case comparison leads to *themes* and a *typology* of three types of design management absorbers in Chapter 7 (Discussion). Furthermore, the model is adapted based on the experience of its use as an evaluation tool.

Chapter 8 (Conclusions) outlines the *contributions to knowledge* and *practice* and makes *recommendations* for members of design support programmes or for designers are formulated. Chapter 8 ends with *limitations* and *further research directions*.

A few general remarks: The author of this thesis is aware of the fact that the building blocks in Chapter 2 have many overlaps with one another or are making reference to even broader concepts of business or economic sciences. As Cruickshank (Cruickshank, 2010) puts it, many disciplines such as management studies, economics, entrepreneurship, psychology or sociology are about to emerge in the broader notion of innovation studies.

Also, the theory and the state of the art of academic research in each single building block are so broad that this thesis will not be able to provide an extensive overview. Instead, it will try to capture some essential concepts in relation to the central topic of this thesis, *design management absorption* in SMEs with little or no prior design experience.

Conversely, the theory at the beginning of this literature review also supports a broader understanding of design management and design-driven innovation for companies, independent of size and trade. Some concepts described in this thesis such as the absorptive capacity construct can be used in big organisation or in other contexts. However, in this thesis, we concentrate on measuring design management knowledge absorption.

Since this action research project has been conducted in Switzerland the specific cultural, economical and political situation of this country will be taken into account as well. Although Switzerland is "embedded" in the European context, there are differences, e.g. in the way innovation or design policies are handled.

1.3 Prior research

Since 2005, the author of this thesis has been conducting research in the areas of design management and design-driven innovation in SMEs. The first project dealt with the state of the art of design management practice in Switzerland (Acklin et al., 2006) as mentioned before. One project aimed at developing a visualisation of the concept of design management, an Integrated Design Management Model (Acklin, 2009). Two applied research projects (Acklin, 2011; Acklin & Hugentobler, 2008) investigating the integration of design in eleven SMEs in Central Switzerland between the years 2007 – 2010 were the direct harbingers of this present PhD-project. However, these projects did not look at SMEs from an absorption perspective yet.

These projects rather aimed at facilitating the integration of design management in regional SMEs by either intensifying cooperation with the University or with other relevant actors of the regional innovation system. Nevertheless, during these projects

several tools and frameworks were developed: firstly, a tool called Design Management Travel Guide[3] (Acklin & Hugentobler, 2008), with which the level of design integration can be assessed and design strategies to improve market positioning and customer focus can be developed; secondly, the Integrated Design Management Model (Acklin, 2009), and thirdly, a Design-Driven Innovation Process Model (Acklin, 2011)[4].

Some of these frameworks are mentioned during the literature review as knowledge the author of this thesis has accumulated in the past. Furthermore, these frameworks have been introduced to the eight SMEs under study.

[3] The basic underlying metaphor comes from the field of cartography. It displays a sea map of a fictitious archipelago of four islands. Each represents a specific degree of design maturity (cf. the Danish Design Staircase, 2001), with routes departing from one island and arriving at the next, where one can find and learn more about the resources necessary for achieving improved design integration. A "wind rose" represents the challenges and winds of change for all islands of the archipelago. This guide was successfully tested with another batch of SMEs.

[4] also see Appendix A.3

2 Building blocks of literature review

To understand such a phenomenon as design management absorption and organisational learning and capability building during design-driven innovation processes in SMEs is a complex thing. These four building blocks (see Figure 1) constitute a significant portion of the literature review. They are all part of the broader topics of organisational theory or innovation studies and have been tailored to understand the specific sample of SMEs involved in the action research project. Figure one visualises how the buildings blocks of the literature review connect and interrelate.

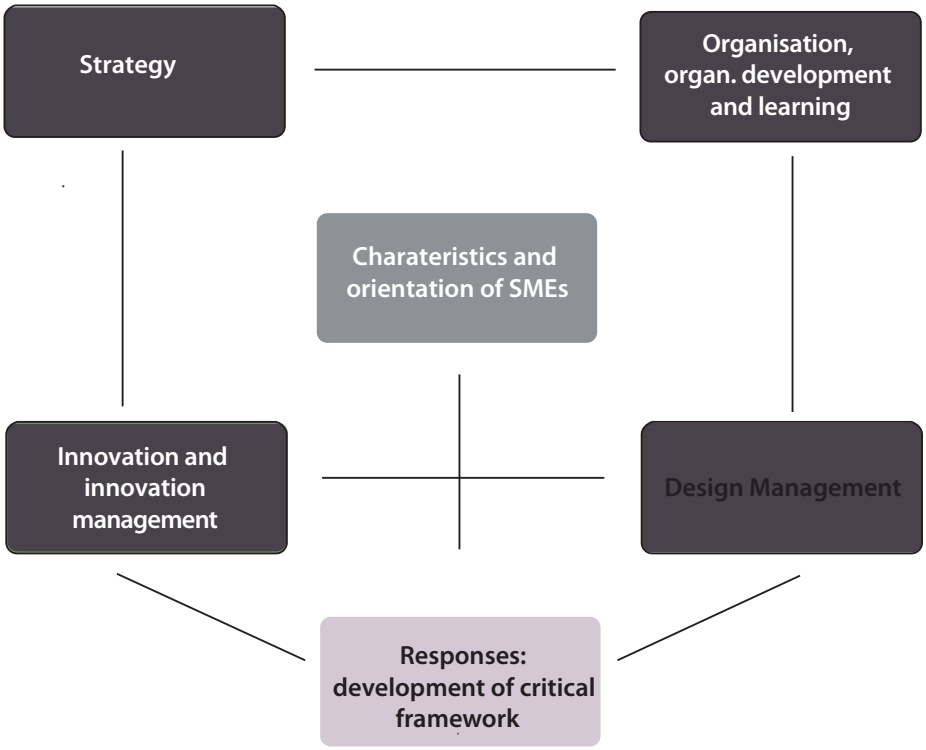

Figure 1: The chapters of the literature review

2.1 Building block 1: Strategy

One of the most central questions companies have to deal with in the face of the many uncertainties and dynamic changes of their environment is strategy. The strategy will decide about their long-term survival on the market. To come up with the right strategy

raises a second question: How can the company find its (new) direction given its history, paths and available resources? While the first part of strategy building deals with the vision of the company (or the outside-in perspective), the second part deals with the question of how willing and able an organisation is to learn and to adapt to changing circumstances (or the inside-out perspective).

Over the last twenty years, the focus of *strategic management* has slowly shifted from the first question or an outward directed understanding of strategy to the second question or an inward direction. Ever since its origins in the 60s, the literature on strategic management has grown to an immense size. A "Strategy Safari" (Mintzberg, Ahlstrand, & Lampel, 2007) synthesizes nearly 2000 texts of this discipline into 10 schools of strategic management. The first three schools of thought *prescribe* how companies attain competitive advantage by designing plans, analysing markets and positioning their firms into the right market environment.

Later schools *describe* how strategies emerge and deduct from these observations how a company's resources and capabilities should be organised and adapted to the changing environment to match market needs or even gain competitive advantage through the deployment of unique, valuable and hard to imitate resources of a company. While the *prescriptive* schools look from the inside out onto the market, *descriptive* schools of thought tend to focus inside first and to roll out their strategies based on the core competencies a company possesses, develops, regroups, or newly acquires.

In the following chapters, we will focus on the *descriptive* schools of strategic management. Firstly, because they emerged in the 90s and are still widely accepted today; secondly, because they are more able to propose actionable plans in a market environment that is characterized by its unpredictability and, thirdly, because they advocate fostering and building on idiosyncratic resources, which can include e.g. product designs (Nonaka & Takeuchi, 1994). We argue, that *the resource-based view* (Barney, 1991) and the *dynamic capabilities approach* (Helfat et al., 2007; Teece, Pisano, & Shuen, 1997), which has been derived from the former are more compatible with design management and design approaches today.

After a very short general introduction into the *definition* of strategy, the *history* of strategic management and into the *5 perspectives* of strategy building in this chapter, we will focus on the resource-based view (RBV) and the dynamic capability construct (DC). Finally, we will conclude with a short review of terms such as *core competency, resources, capabilities* and *capacities,* which are widely and ambiguously used in the RBV and DC literature.

2.1.1 What is strategy?

One of the top management's tasks is to build the prerequisites for the long-term survival of the company on the market (Rüegg-Stürm, 2003). A company needs to develop the necessary knowledge to give orientation to and to align corporate activities. For this purpose, top management has to deal with five essential topics (Rüegg-Stürm, 2003, pp. 40-41):

- It needs to build knowledge about the needs, concerns and ways of communication of their central stakeholders,
- to define the offerings of the company,
- to clarify the focus of the value creation process,
- and by doing so will determine the fields, in which it will cooperate with others (e.g. suppliers)
- It also has to assess which core competencies the company owns and which might need to be further build up to produce sustained competitive advantage and customer benefit.

This body of knowledge will allow for formulating goals and competitive strategic positions. James Brian Quinn (1996) offers the following definition of strategy:

> A strategy is a pattern or a plan that integrates an organization's major goals, policies and action sequences into a cohesive whole. A well-formulated strategy helps to marshal and allocate an organization's resources into a unique and viable posture based on its relative internal competencies and shortcomings, anticipated changes in the environment and contingent moves by intelligent opponents. (p. 5.)

While Rüegg-Stürm's (2003) list of strategic issues as outlined above is without any connotations, Quinn's (2003) definition reverberates with military or diplomatic bodies of thought ("to marshal", "viable posture" etc.) and the author himself offers later in the text the connection to strategists as Sun Tzu, Napoleon, Von Clausewitz or Lenin (Mintzberg, Quinn, & Ghoshal, 1996). However, Quinn's (1996) definition points to a dilemma each company has to face: the gap between internal competencies and anticipated changes in the environment, and how to bridge it through goals, policies and action sequences.

Quinn's (1996) definition also makes a distinction between strategy as a *plan* and strategy as a *pattern*, a distinction introduced by Henry Mintzberg already in the 80s. According to Mintzberg (1996) strategy can be a consciously intended course of action for the future, a *plan*; through rolling out this strategy a *pattern* will emerge demonstrating which part of the original strategy failed and which one proved to be right. Another way of framing strategy is through a *position,* through pointing outward to a market the

company strives for. Strategy as *perspective* on the other hand focuses inward on the way a company organises itself to move forward with a perspective in mind.

Nonaka and Takeuchi (1995) date strategic management back to the 60s, to the Product Portfolio Management framework developed by the Boston Consulting Group, "a system in which the flow of funds for a product or a business is determined by a combination of market growth and relative market share" (p. 40). Nonaka and Takeuchi (1995) also mention PIMS, the Profit Impact of Marketing Strategy, created by a project team at General Electrics as a harbinger of strategic management. The PIMS model was used to identify factors that contribute to higher return on investment like e.g. quality of product.

Nonaka and Takeuchi (1994) compare these frameworks and others like Porter's Five-Forces Model or the Value Chain Model (Porter, 1985) with Taylorism and it's strong emphasise on logical and analytical thinking. Like Mintzberg (1996) the two Japanese scholars underscore the highly prescriptive character of the *scientific approach* to strategic management, which makes analysts and senior managers the central stakeholders of strategy building and of a top down process of implementation. Conversely, in Japanese companies middle management plays an important role in interpreting signals from the environment; it is much more able to influence a company's strategy (Nonaka & Takeuchi, 1995)

In contrast to the *scientific approach*, Nonaka and Takeuchi (1995) mention a *humanistic approach* to strategic management that stresses the importance of a company's culture of how it behaves and thinks. In their view, the *humanistic* approach is more able to include values, experiences or resources into strategy building from everywhere inside the company than the *scientific* or the *prescriptive* approaches to strategy building. Amongst other things, Western strategic management scholars and practitioners have learned from Japanese companies like Honda, Xerox or Canon that the source of competitive advantage can be connected to the skilful deployment of company specific resources and knowledge (more see in Chapter Organisational knowledge creation 3.2.8).

Also the Blue Ocean Strategy concept criticises competing for markets and positions going in the wrong direction (Kim & Mauborgne, 2004). Kim and Mauborgne (2004) suggest finding a piece of uncontested market space instead of fighting over the "red oceans". The authors studied 150 blue ocean creations in over 30 industries and back more than 100 years and discovered the logic behind this different form of strategy. Blue oceans do seldom invent new technology but work with the existing ones; most blue oceans are created from within the industry (by reducing or eliminating the factors the industry competes on); blue oceans do not use the competition as a benchmark and set out to offer their customers more value for less money.

2.1.2 Resource-based view

With the Resource-based View (RBV) the attention of strategic management scholars shifted from an outward-oriented thinking about gaining market positioning through playing tactical war games with competitors to an inward-oriented thinking putting unique and truly distinctive resources of a company at the centre (Stalk, Evans, & Shulman, 1992). Stalk et al. (1992) state:

> In a world characterized by durable products, stable customer needs, well-defined national and regional markets, and clearly identified competitors, competition was a 'war of positions' in which companies occupied competitive space like squares on a chessboard, building and defending market share in clearly defined product or market segments. The key to competitive advantage was where a company chose to compete. How it chose to compete was also important but secondary, a matter of execution. (p. 62)

Stalk et al. (1992) propose to compete on *capabilities* to win on "movements" not of positions anticipating market trends and responding quickly to customer needs. The authors made the observation that specific capabilities distinguish one firm (like Kmart) from another (like Wal-Mart). In the run of ten years, the latter had outperformed the former by focusing on one specific key capability: the way the company replenished inventory by "cross-docking". Goods are continuously delivered to the warehouses, where they are selected, repacked, and then dispatched to stores without ever sitting in inventory.

Stalk et al. (1992) state that the new building blocks of strategies are not products but *business processes*. Competitive advantage is about transforming company's key processes into *strategic capabilities* that create superior value to customers. These capabilities need to transcend Strategic Business Units; they need to be accessible across departments and units.

The authors argue that once capabilities are used in a strategic manner, companies become "capabilities predators", able to come out of nowhere and move rapidly from non-participating to major players. However, often capabilities are mutually exclusive. "Choosing the right ones is the essence of the strategy" (p. 69).

Two years before, the concept of core competencies was introduced (Prahalad & Hamel, 1990). Using the same rationale as Stalk et al. Prahalad and Hamel (1990) state:

> In the 1990s, they'll [top executives] be judged on their ability to identify, cultivate, and exploit the core competencies that make growth possible – indeed, they'll have to rethink the concept of the corporation itself. (p. 79)

A *core competency* is the ability to consolidate corporate wide technologies and production skills into competencies that empower individual businesses to adapt quickly to changing opportunities. They are connected to *collective learning*, "especially how to coordinate diverse production skills and integrate multiple streams of technologies" (p.

82). Prahalad and Hamel compare a diversified company with a large tree with many branches and leaves. The trunk and major limbs are core products, they state, the smaller branches are business units, the leaves, flowers, and fruits are end products. The core competencies provide nourishment to the company like the roots of the tree; they are hidden to the outside world.

Unlike Stalk et al. (1992) who talk about business processes linking specific capabilities from production to distribution etc., in Prahalad and Hamel's (1990) concept core competencies are built from technologies and production skills, which will express themselves in a myriad of different products. For example, Canon has been using its optical systems for such diverse product categories as cameras or printers.

RBV while widely adopted by many scholars was also criticised by others. Lazonick (2005) posits that the RBV (Barney, 1991) provides no perspective on why and how some firms, rather than others, accumulate valuable and inimitable resources, or what makes these resources valuable and inimitable.

2.1.3 Dynamic capabilities

In 1997, Teece, Pisano and Shuen coined the term *dynamic capabilities* (DC), mediator capabilities between external forces and internal resources to respond to the changes of dynamic environments. Teece's et al. (1997) framework is helpful to understand what companies need to do in the "'Schumpeterian' world of innovation-based competition, price/performance rivalry, increasing returns, and the creative destruction of existing competences" (p. 509).

The term *dynamic* refers to the *capacity* to renew competences so as to achieve congruence with the *dynamic* business environment; the term *capabilities* emphasises the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources and functional competences to match the requirements of a dynamic environment.

Teece et al. (1997) connect the *dynamic capabilities* concept to the RBV as described by Barney (1991). Resources are valuable, rare, imperfectly imitable and imperfectly substitutable (VRIN). However, a company's resources can be "sticky", which means that in the short run firms are stuck with whatever resource they have; or they might have to live with whatever they lack (Teece, Pisano, & Shuen, 1997). RBV does not address how to create future valuable resources or how the stock of valuable, rare, etc. resources can be refreshed in changing environments (Ambrosini & Bowman, 2009b). DC, however, are used by companies that develop, deploy and reconfigure internal and external resources continuously.

Ambrosini and Bowman (2009) reviewed much of the academic literature that has been written on DC since 1997. They noticed some confusions and inconsistencies

concerning the definition of DC. "A dynamic capability is not a capability in the RBV sense, a dynamic capability is not a resource. A dynamic capability is a process that impacts upon resources" (p. 34). While operational capabilities are about every day's business, dynamic capabilities are about intentional change.

Examples of DCs are organisational processes such as product development routines, alliance and acquisition capabilities, resource allocation routines and knowledge transfer and replication routines (Helfat et al., 2007). These examples have in common that they will have an impact on the firm's resources. But while some DC might lie dormant in a company, some might need to be deployed continuously like e.g. R&D activities. According to Ambrosini and Bowman (2009) the value creation process of DC follows the logic of:

1. DC creation processes as a result of experience and organisational learning will lead to
2. the creation of dynamic capabilities
3. which in turn will impact on the resource base.

DCs also can be seen in the light of their outputs, the creation of resources that sustain a competitive advantage. However, opinions of scholars are divided when it comes to the link between DCs and competitive advantage. While the VRIN resource base is directly responsible for rents (Ambrosini & Bowman, 2009), the effects of DCs are more indirect. The link between DC and competitive advantage can even be decoupled (Helfat et al., 2007). Instead the yardstick of *evolutionary fitness* to describe how well a DC enables a company to make a living by modifying its resource base is introduced; and the yardstick of *technical fitness*, a company's internal measure of capability performance (quality per unit cost). Ambrosini and Bowman (2009) put it like this: evolutionary fitness is 'doing the right things' and technical fitness is 'doing things right'.

Although scholars keep on discussing the characteristics and the implications of the DC construct, it certainly supports a more fluid, more capability based notion of strategy. Strategy formation (often implicitly) happens through the choice of company leaders to attribute resources to certain projects or not. Whether for example an industrial designer is included into NPD or not will certainly affect company learning, the outcome (the product) and by doing so might indirectly have an effect on the positioning and further strategy of the company.

2.1.4 Core competencies, resources, capabilities, capacities

The notions of *core competencies, resources, capabilities, capacities* and *skills* have been highly debated ever since the RBV and the DC concepts have been introduced. To clarify these

terms the definitions of several more scholars are introduced (Amit & Schoenmaker, 1993; Barney, 1991; Helfat et al., 2007; Tampoe, 1994).

Building on Prahalad and Hamel (1990), Tampoe (1994) develops a set of criteria to identify *core competencies*. They must be:

- essential to corporate survival in the short and long term
- invisible to competitors
- difficult to imitate
- unique to the corporation
- a mix of skills, resources, and processes
- a capability which the organization can sustain over time
- greater than the competence of an individual
- essential to the development of core products and eventually to end products
- essential to the implementation of the strategic vision of the corporation
- essential to the strategic decisions of the corporation, i.e. on diversification downsizing, rationalizing, making alliances, and joint ventures
- marketable and commercially valuable
- few in number.

Barney (1991) defines *firm resources* as all assets, capabilities, organisational processes, firm attributes, information, knowledge, etc. "controlled by a firm that enables the company to conceive of and implement strategies that improve its efficiency and effectiveness" (p. 101). While a company might own many different resources, only specific ones will be able to sustain competitive advantage in the sense of the RBV.

Amit and Schoenmaker (1993) define *resources* in a similar way like Barney (1991), but they clearly distinguish *capabilities* from *resources*. Capabilities are the firm's *capacity* to deploy resources:

> They are information-based, tangible and intangible processes that are firm-specific and are developed over time through complex interactions among the firms resource. (p. 35)

Capabilities are "intermediate goods" (p. 35) able to enhance the productivity of a company's resources. Unlike the resources of a company, capabilities are built through exchanging information through the firm's human capital or are even acknowledged by the firm's customer base (e.g. as brand names). Amit and Schoenmaker (1993) state that *capabilities* are often developed in functional areas like brand management in marketing.

The DC view (Helfat et al., 2007) defines *capacity* as the ability to perform a task in at least a minimally acceptable manner. A dynamic capability enables a company to do

something different not necessarily better. However, as to qualify as a *capability* this specific capacity must contain a "patterned" or recurring element. Capabilities are not a one time lucky action or an innate talent. A company needs to be able to apply capabilities "purposefully" which includes some degree of intention and the ability to react to emerging streams of activity. There is also some kind of "search" involved, e.g. in product development this would involve the search for new products to introduce; with this comes "decision making" whether or not to enhance current assets and capabilities.

2.1.5 Summary building block 1

While the concept of *core competencies* as described by Prahalad and Hamel (1990) or Tampoe (1994) sits well with the sector of investment goods, it does not so well with the service sector or to some extent with the consumer goods sector because of its emphasis on technologies. The notion of *capabilities* as defined by Stalk et al. (1992) or Amit and Schoenmaker (1993) is more able to include intangible forms of capability such as communication, transfer of knowledge or coordination – activities that are seminal for design management as we will see later.

After nearly 15 years of academic debate, the concept of DC is sometimes hard to understand. Ambrosini and Bowman (2009) even doubt the utility of the concepts for the field of strategic management because "for dynamic capabilities to be a useful construct it must be feasible to identify discrete processes inside the firm that can be unambiguously causally linked to resource creation" (p. 44). E.g. there can be a long lead-time between decisions to change the resource stock and the resultant impacts on performance.

However in our view, the framework of dynamic capabilities has the potential of being an interesting one for design management. Actually, design management and the innovation process can be viewed as a dynamic capability, such as the capability of altering, reconfiguring, modifying the resource base of a company to respond to rapid changes in the environment and to achieve evolutionary and technical fitness through designing and design management. How the framework of evolutionary and technical fitness can be helpful to conceptualise design and design management as a dynamic capability, will be further discussed in Chapter 4, Responses.

2.2 Building block 2: Organisation

In "The Theory of the Growth of the Firm" (1959) the American economist Edith Penrose posits that the firm is a collection of resources bound together by an administrative framework and "authoritative communication" (p. 17); the company is organising these resources for the production and sale of services and products for a

profit and engaging in productive opportunities. When in 1959, Penrose[5] published her book she was one of the first - if not the first - to describe companies from the inside out rather than from the outside in or a market perspective.

In neoclassical economic theory firms respond to the environment they are in by supplying products the market demands. Penrose, on the other hand, views the company as a bundle of productive resources with a management team deciding on how to expand and to deploy services to use its resources. Ultimately, Penrose has been writing about entrepreneurship and innovation as a way to growth funded on the ability of management to put unused resources at work and combining them with new ones (Penrose, 1959).

This is still the concern today: Not the market, but *organisation* is instrumental for the capability of a firm to innovate. This section focuses, firstly, on organisational innovation, the overlap of organisational theory and innovation studies. It will follow three categories of organisational innovation[6]: one which predominantly focuses on the link between *structures* and the propensity of a company to innovate (see Mintzberg's, 1996, *Entrepreneurial* and *Innovative Organisation* in 3.2.1); one that focuses on *organisational cognition* and *learning* (see Nonaka & Takeuchi, 1995, the *Knowledge Creating Organisation;* and Senge, 1990, the *Learning Organisation* in chapter 3.2.2) and one that looks at organisational change and adaptation in the face of (disruptive) change in the environment (Christensen, 1997; Tushman & O'Reilly's, 1996, *The Ambidextrous Organisation* in 3.2.3).

Another common denominators of organisational innovation are *organisational development (OD)* and *organisational learning (OL)*, processes that shape companies into innovative, dynamic and flexible organisations. The second part of this chapter will introduce concepts of Lewin (1945) or Watzlawick, Weakland, & Fish (1974) on OD, and on *OL* as a prerequisite of change and organisational development by Huber (1991), Argyris (1976), Argyris and Schön (2006). Around 15 years ago, Japanese scholars (Nonaka & Takeuchi, 1995) also elaborated on the notions of *tacit* versus *explicit knowledge* and with it the concept of *organisational knowledge creation*.

2.2.1 The Entrepreneurial and the Innovative Organisation

According to Henry Mintzberg, the Canadian management scholar, companies tend to choose an organisational form that fits their environment and enables the interplay between the environment and the company's organisational structure. Mintzberg describes several forms of organisational configurations that distinguish companies from

[5] "The Theory of Growth of the Firm" is often referred to in the context of the RBV. Penrose's ideas had little impact on contemporary economic theory but some 40 years later scholars of the RBV and the DC constructs picked up on them.
[6] as summarised by Alice Lam (Lam, 2005)

one another by looking at their structure, their processes and strategy formulation (Mintzberg, 1979; Mintzberg et al., 1996)[7].

The basic elements of organisations (Figure 2) are:

- ideology (the traditions and beliefs of an organisation)
- strategy apex (the control centre of the organisation)
- techno structure (that designs, plans, changes or trains the operating core)
- middle line (the connection between strategic apex and operating core)
- support staff (the specialists providing support to the organisation)
- operating core (the people related to the production of services or products).

While all organisations have most of these structural elements, not all configurations emphasise them in the same way. A company chooses a specific "compilation" of these elements. It's structure is a response to internal and external forces and might even react in different ways, for example by putting much of its emphasis on the strategic apex or by putting it on the middle line of the company. In the first example top management reacts to the changes of the environment through a strong vision or sheer will; in the second an interdisciplinary innovation and expert team might be in the driver's seat giving the company its direction. Also: Companies can change configuration when either the environment changes or the way the organisation decides to respond to it.

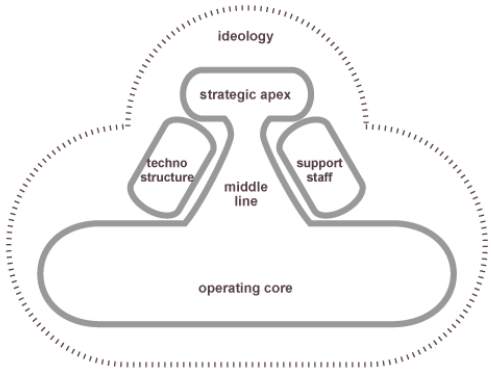

Figure 2: Basic organisational elements according to Mintzberg (1979)

Mintzberg (1996) names five configurations:

- the entrepreneurial organisation
- the machine organisation (bureaucracy)

[7] Mintzberg (1979) introduced his five organisational configurations in *The Structuring of Organization*. Englewoods Cliffs, NJ: Prentice Hall. In this chapter, we will refer to the following publication: Mintzberg, H., Quinn, J. B., & Ghoshal, S. (1996). *The Strategy Process. Concepts. Contexts. Cases.* Harlow: Pearsons Education Limited.

- the professional organisation
- the divisional (diversified) organisation
- the innovative organisation ("adhocracy")

Only the entrepreneurial and the innovative organisation relate to SMEs. Also, characteristics of innovative firms can be found in the *innovative* and in the *entrepreneurial organisation*. The latter is basic, simple or even a non-structure and tends to be related to the early days of a company, when aggressive energy to conquer new markets is needed. Some will quickly grow larger and require more formalized procedures or specialized forms of expertise; others might stay in their entrepreneurial form more or less as long as their founding leader remains in office. However, not all of these executives remain 'entrepreneurs'. "Many settle down to pursue common strategies in small geographic niches" (p. 590). Mintzberg mentions the local producer, the restaurant, or the bakery as examples.

Also the 5th configuration, the *innovative organisation* can be small like an entrepreneurial organisation. Mintzberg (1996) calls the innovative organisation an *adhocracy* and describes the following characteristics of these companies: Adhocracies have highly organic structures; little formalisation of behaviour; specialised jobs based on experts; a tendency to deploy experts in small project teams to do their work; a reliance on teams and task forces and on integrating managers of various sorts to encourage mutual adjustment. The key mechanism of adhocracies is coordination within and between these teams. There is also considerable decentralisation to and within these teams, which are located at various places in the organisation and involve various mixtures of line managers and staff and operating experts (Mintzberg, 1996).

This specific configuration can be found in environments that are both dynamic and complex. Examples that Mintzberg (1996) mentions are: the manufacturing firm that custom-makes each of its products to order, the engineering company that produces prototypes, or the fabricator of extremely expensive machinery. These recurring new projects encourage the organisation to take on the structure of an adhocracy to offer highly customer-focused services. Mintzberg (1996) calls this an *operating adhocracy*; distinguishes the *administrative* from the *operating adhocracy*; the latter could be a research body like NASA that produces one project after the other within a specific field, e.g. astrophysics.

Entrepreneurial organisations gain much of their strength from a strong sense of mission and are able to attract employees willing to strongly identify with the company. However, other people might experience entrepreneurial organisations as restrictive. Mintzberg (1996) also remarks that entrepreneurial organisations might perhaps be an anachronism in democratic societies because of their paternalistic and autocratic leadership.

On the other hand, the managers of innovative organisations seldom 'manage' in the usual sense of the word. "Instead, they spend a good deal of their time acting in a liaison capacity, to coordinate the work laterally among the various teams" (p. 695). Mintzberg stresses the point that many people, especially creative ones, dislike both structural rigidity and concentration of power. He calls the innovative organisation the most democratic and less bureaucratic configuration.

A downside of this configuration is the necessity for extensive communication amongst team members, which produces inefficiency and high costs. The workload in innovative organisations is often not distributed evenly and these organisations can get "politicised" through power plays of managers and experts. Little definition of structures and hierarchies can produce anxiety related to the end of one project and the (indefinite) start of the next in employees and the urge to control the uncontrollable.

Comparing the entrepreneurial organisation and the adhocracy, we could say that the former is the closer description of SMEs, because of its strong orientation towards a founder personality that wants to set his stamp on the company (and on the world). Entrepreneurial organisations are strong at starting something new.

In Mintzberg's (1996) view, innovative organisations in comparison are designed for the special effort it takes to come up with complex innovations. An entrepreneurial organisation might at certain times turn to an innovative form to take the next step but then will exploit the new product incrementally changing it until the end of its life cycle. Innovative organisations might feel the push to become more stable and more bureaucratic for instance by finding a good market niche, the right product and start mass-producing it.

2.2.2 The Learning and the Knowledge Creating Organisation

In the early 90s scholars introduced the notion of the *knowledge society* (e.g. Drucker, 1994) pointing to a shift in society from the industrial to the "knowledge worker"[8] and in attention of what constitutes a resource for society and economy in the present and in the future: No longer plants, land or equipment constitute central assets for companies, but their ability to learn and create new knowledge. In 1990, in the US, Peter Senge launched the concept of the *Learning Organisation,* "where people are continually expanding their capabilities to shape their future" (p. 42). The core of this organisational form is *continuous learning* combined with *system's thinking*. Senge (1990) formulates the principle of *creative tension*, a combination of an accurate picture of current reality as well as a compelling picture of the desired future.

[8] According to Drucker (1994) he coined the term already in 1959.

Creative tension has to be created by a new kind of leader, who aims at building a shared vision, to surface and test mental models and to understand complex situations through the lens of system's thinking.

The two Japanese scholars Nonaka and Takeuchi (1995) also took the notion of the *knowledge society* as a starting point for their seminal theory of *organisational knowledge creation* and the *knowledge-creating organisation*. However, Nonaka and Takeuchi (1995) detect limitations in Senge's concept of the *learning organisation.* In their opinion, system's thinking is not enough; it does stress the importance of understanding phenomena or patterns from many different perspectives but system's thinking is mainly using the mind to do so not the body. *Tacit knowledge* (for definition of this term see later Chapter 4.2.2) of organisational members is not part of a *learning organisation*.

Nonaka and Takeuchi (1995) and Nonaka (1994), Nonaka & Takeuchi (1995), Nonaka, Umemote, & Senoo (1996), and Nonaka & von Krogh (2009) challenge concepts of mainstream Western organisational theory, which suggests that the limitations of individual members of an organisation do have to be counterbalanced by rational structures to process information. However in the Japanese view, organisational knowledge creation is not about constraining problems but about defining new problems and creating, exploring, and experimenting with new solutions.

The key player of knowledge creation in an organisation is the middle management, because it synthesises the tacit knowledge of both front-line employees and senior executives, makes it explicit and incorporates it into new products and technologies. The main task of top management is to "dream up" a vision or a future for the company while middle managers will translate these visions into mid- to short-term projects with the help of tacit knowledge from lower levels. This leadership style has been named *middle-up-down-management (*Nonaka, 1994).

The Japanese scholars also connect organisational knowledge creation to the RBV and the dynamic capability concept, which have been discussed in Chapter 2.1.2 and 2.1.3, making evident that the links between organisational learning, innovation, dynamic capabilities and knowledge creation are tightly knit.

2.2.3 The Ambidextrous Organisation

In 1996, Tushman and O'Reilly coined the term *The Ambidextrous Organisation*, a company that is able to successfully pursue the course of steady incremental innovation in mature markets as well as staying on top of new developments, which might include disruptive technological leaps[9]. Managers will have to manage "evolutionary change

[9] A good example for the impact of disruptive technologies is the Swiss watch industry where after the massive introduction of quartz movements by Japanese companies like SEIKO – a technology that by the way had been invented in Switzerland - many Swiss companies went bankrupt. In the following years, the SWATCH group was not only able to conquer that market back but also to stabilise much of the Swiss watch industry. SWATCH introduced a process innovation through the simplification of the construction of

punctuated by discontinuous or revolutionary change" (p.11). The authors compare these managers with jugglers because they will have to increase the alignment and fit among strategy, structure, culture and processes while preparing for change (Tushman & O'Reilly, 1996).

They also point to two factors for the inhibition of change; one is *structural inertia,* a resistance to change rooted in the size, complexity, and interdependent organisation's structures, systems, procedures, and processes; and *cultural inertia* that consists of informal norms, values, social networks, myths, stories etc. Both *structural* and *cultural inertia* increase with size and age of the company. While these phenomena do not necessarily constitute a problem within a stable market, they do when it comes to forced change caused by disruptive technologies.

Many companies paradoxically fail because they have been successful. According to Christensen (1997) disruptive technologies have early-mover advantages over later entrants, but also have low profits in small niche markets at the beginning. That's why many big organisations do not act on disruptive technologies; on the contrary, the stronger an organisation becomes the weaker is the argument that emerging markets can be useful engines for growth (Christensen, 1997). In early 2012, a famous casualty of the innovator's dilemma has been Kodak. The company invented some a disruptive technology, the digital camera that floods the market today. However, in order not to cannibalise its core business of developing analogue films and photos, the company did not act on their invention.

To counteract this dilemma managers of established companies with sustained innovation are in, Christensen (1997) suggests setting up autonomous organisations that build a new and independent business around the disruptive technology[10]. Tushman and O'Reilly (1996), on the other hand, describe a few companies that have been successful in managing incremental innovation as well as disruptive technologies. Drawn from best practice they suggest to break down the organisation into small units, profit centres etc. that allow for a feeling of ownership, responsibility and autonomy of managers, and the acceptance of multiple cultures in the overall organisation. This way companies are able to provide a tight-loose relationship between units and the "mother organisation" with a strong overall corporate culture and in parallel a massive decentralisation of decision making.

the watch; it now consists of only 51 pieces instead of 91 like before. The watch can be assembled in a short time and fully automated. SWATCH also introduced a paradigmatic change in the meaning of the watch; through the use of design the watch moved from being an investment for live into being a lifestyle accessory. The story of SWATCH is also an excellent example of design-driven innovation.

[10] This is an advantage SMEs have over large organisations; they would be more able to act on small and emerging markets.

2.2.4 Organisational development

While the first three subchapters categorised different organisational forms capable of innovating, the following two subchapters focus on the underlying currents present in companies when change and adaptation is involved: organisational development and organisational learning. In the past, scholars have borrowed many concepts, metaphors, and theories from other disciplines, ranging from child development to evolutionary biology. Four basic theories and a typology based on them permeate all seminal concepts of OD and change in organisations (Van de Ven & Poole, 1995):

- *Life cycle*: its basic metaphor is *organic growth* and change is something imminent.
- *Teleology* with the metaphor of *purposeful cooperation* describes organisational entities as purposefully moving towards a goal or an end state.
- *Dialectics'* guiding metaphor is *opposition and conflict*. Change happens when opposing values, forces, or events gain sufficient power to confront and engage the status quo.
- *Evolution*: with its metaphor of *competitive survival* like in biology refers to a continuous cycle of variation, selection and retention; variation and change usually happens in slow and little steps; but it can be that development proceeds in sudden saltations.

One of the most valuable contributions of these four basic theories is the possibility that very different theories can be compared and that similarities and discrepancies can easily be identified. E.g. based on two mathematical theories Watzlawick, et al. (1974) introduced the concept of *first-order* and *second-order change*, which is close to the evolutionary model outlined above. First-order change occurs within a given system, which remains unchanged; second-order change is one that changes the system itself, it is "change of change". First-order change is incremental in a stable and predictable way, while second-order change might include a break from past assumptions and following new emergent goals and strategies.

Another example of dialectic theory is the one of *change as a proces*s (Lewin, 1947). According to Kurt Lewin, the founding father of social psychology, change is a process that starts with the analysis of the conditions of "no change", of the present state of a *quasi-stationary equilibrium*. The forces for or against change in a specific field are quasi-stable and are upset by any kind of force pushing in only one direction. That's why Lewin's famous *three-stage model* of *unfreeze, change* and *freeze* (described by Schein, 1964, se Table 1) has been named *resistance to change*; for each force there will be a counter force.

Table 1: Processes and mechanisms underlying each stage (Schein, 1964), p. 79

Stage 1: Unfreezing: creating motivation to change	
Mechanisms:	a) Lack of confirmation or disconfirmation
	b) Induction of guilt-anxiety
	c) Creation of psychological safety by reduction of threat or removal of barriers
Stage 2: Changing: developing new responses based on new information	
Mechanisms:	1) Identification: information from a single source
	2) Scanning: information from multiple sources
Stage 3: Refreezing: stabilizing and integrating the changes	
Mechanisms:	a) Integrating new responses into personality
	b) Integrating new responses into significant on-going relationships through reconfirmation

Lewin (1947) describes two possible strategies to tackle resistance: by either adding forces in the desired direction, or by diminishing opposing forces. With the former strategy, tension will increase bringing aggressiveness, emotionality and lower constructiveness with it; in the latter, tension will decrease, which is more desirable.

To lower resistance group decision processes are helpful measures. Since members of a group adopt its prevailing values and habits to not be outcast from the group, change will always have to take place in the individual as well as in the group itself. Lewin's theory implicitly suggests that change in social groups is not an easy thing to handle and that change processes should be undertaken parsimoniously, because the unfreezing of habits will be accompanied by anxiety and uncertainty in the individual and the group.

Watzlawick et al. (1974), conversely, do not describe change as a process but rather as interplay between problem formation and problem solution. This interplay can include the surprising paradox of: the more things change, the more they stay the same. During problem formation several mechanisms can be at play that avoid a solution. E.g. if somebody applies a solution that worked in the past and then just does "more of the same" the problem might get worse instead of better. Also simplification of the problem, utopian plans such as the extreme notion that one has found the ultimate solution, or

communication paradoxes like "be spontaneous!" can impede problem resolution or change. Whoever applies these kinds of solutions to a specific problem will stay stuck with first-order change.

Second-order change on the other hand will deal with the failed solutions the first-order change methods produced. These failed solutions can become the keystone to the problem solution and might lead to sometimes weird or unexpected solutions by placing them in a different frame. This change will then appear as a *saltation* in problem solution. The central technology of change - or the gentle art, how the authors name it - is *reframing*. Watzlawick et al. (1974) state:

> To reframe, then, means to change the conceptual and/or emotional setting or viewpoint in relation to which a situation is experienced and to place it in another frame which fits the 'facts' of the same concrete situation equally well or even better, and thereby changes the entire meaning. (p. 95)

Although this form of intervention is often used in a psychotherapeutic setting, it is evident that the above-mentioned principles apply to many change projects of any possible organisational entity. Watzlawick et al. (1974) also stress the point that the tactic chosen to solve a problem with a patient has to be translated in his or her language and has to be presented to him in form of his frame of mind, his conceptualisation of reality.

2.2.5 Organisational learning and knowledge creation

Argyris (1976) defines *organisational learning* (OL) as "the detection and correction of errors" (p. 365). Errors happen by mismatching, matching being a second condition of learning. Huber (1991) posits, "an entity learns if, through processing of information, the range of its potential behaviours is changed" (p. 89). The two authors connect OL to OD, or even more explicitly state that OL is a prerequisite for development and change.

Huber (1991) conceptualises OL as an expanding organisational process that in the end permeates all units and goes from varied interpretations to a uniform comprehension of the situation at hand (Huber, 1991). In Van de Ven and Pool's (1995) terms (see above), Huber's conclusions draw on a *life cycle model* of organisational learning and development using a sequential logic of OL: first there is knowledge acquisition, then information distribution, information interpretation, and organisation memory.

Knowledge acquisition is being subdivided in processes such as congenital learning or drawing on the knowledge available at the organisation's birth; learning from experience; vicarious learning or learning by observing other organisations; grafting on to itself components that possess knowledge that are needed but not processed by the organisation; and noticing and searching for information about the organisation's environment and performance. The last sub-process connects OL to innovation management, since searching and noticing are central activities of innovation teams.

Argyris (1976) states, that the more complex and ill structured a problem is, the higher will the probability of errors be and the more crucial becomes the learning process before making any decision. At least two sets of variables can be altered to increase the effectiveness of learning:

- one is the degree to which valuable information can be produced
- the other is the receptivity to corrective feed-back[11].

However, there are many inhibiting factors in the way of organisational learning such as distortion and manipulations, lack of open debate, micro-political conflicts between departments and bureaucracies, avoidance of uncertainty etc. Argyris (1976) makes reference to an empirical study that shows that valid feedback is inhibited if the threat of a decision to affect participants is high. Another problem in individuals as well as in organisations is the gap between what people say guides their decisions and what they actually do.

Argyris (1976) and later Argyris and Schön (2006) introduce the notion of two theories of action: *espoused theories* vs. *theories-in-use*. "Espoused theories of action are those that people report as a basis for actions. Theories-in-use are the theories of action inferred from how people actually behave" (Argyris, 1976, p. 367). Individuals will not be able to make a distinction between the two looking at their own behaviour but might well be able to detect the discrepancy in the behaviour of individuals they observe.

One learning model of theory-in-use is the *single-loop model*: People will strive to find the most satisfactory solution consistent with their values or other variables such as achieving a purpose as others define it, winning, suppressing negative feelings, and emphasising rationality. In the single-loop model (of learning) individuals will strive to control power in the organisation and – by doing so – create an environment that has a propensity towards defending and closing up, producing little valid information and reducing free choice.

The *second-loop model,* on the other hand, will produce valid information, free and informed choice, and internal commitment. In this model power will be shared with anyone who is relevant in deciding about implementing action, in the definition of the task, or the control over the environment. However, an organisation would first need to become aware of its present theory-in-use before being able to alter it. This is "a very difficult process, because it requires that individuals question the theories of action that have formed the framework of their actions" (Argyris, 1976, p. 370).

Argyris and Schön (2006) propose that *organising is a process of reflective inquiry*, which is being helped by the implementation of a strategy working through six phases with the support of an interventionist: 1. Mapping the problem as the organisations sees it. 2. Internalisation of a map by organisation through taking responsibility for it. 3.

[11] Some of Argyris' thoughts echo the concept of „wicked problems" as described by Rittel (1973). More will be said about this concept in Chapter 4.3.2 Characteristics of design driven innovation.

Testing the new map through simulations. 4. Inventing solutions. 5. Producing interventions and 6. Studying their impact.

A completely different take on organisational learning comes from Nonaka (1994) and Nonaka and Takeuchi (1995). They argue that organisations should be analysed with the perspective of how they create *knowledge* rather than of how they processes *information* (or correct errors, see Argyris at beginning of this Chapter). Knowledge, in the Japanese understanding, does not only consist of data, information or other forms of *explicit* knowledge that can be captured in writing and drawing; it also includes *tacit knowledge* that often is unarticulated and tied to the senses, movement skills, physical experiences, intuition, or implicit to rules of thumb. The latter also includes mental models, perceptions and beliefs ingrained in people so they take it for granted.

Japanese Zen Buddhism also does not make a distinction between mind and body, so learning does not stem from "putting together diverse bits of information", but "is a highly personal and a organisational process of self-renewal" (Nonaka & Takeuchi, 1995, p. 10). Tacit knowledge develops in individuals over time and is tightly linked to the "know-how" or the (bodily) experiences of people accumulated in a certain context.

This also means that innovation is not the responsibility of a selected few, but of everyone in the organisation by contributing their experience. If tacit knowledge is converted to explicit knowledge it is accessible to all (Nonaka, 1994). While explicit knowledge does not constitute a source of sustained competitive advantage because anybody can acquire it, tacit knowledge is unique in the sense of the RBV. Once "amplified" in the organisation it will become a source of innovation and competitive advantage[12].

2.2.6 Summary building block 2

The closeness of the concepts of *mental models* (Senge), *first-order change* (Watzlawick et al.), or *single-loop learning* (Argyris and Schön) is evident. While they all acknowledge that this operational mode of organisational development and learning has its place, Watzlawick et al. (1974), Argyris (1976) and Argyris and Schön (2006) also describe their limiting force on change. The more ill structured the problem, the less effective are simple forms of learning and the necessity for more powerful forms of transformation grows. The way out of the trap comes from *second-order change* (Watzlawick et al.) and *double-loop learning* (Argyris)[13].

[12] In 2009, Nonaka and von Krogh reacted to both controversies and advancements that occurred during the academic debate after 15 years; the authors still uphold the two premises of (1) tacit and explicit knowledge creation can be conceptually distinguished along a continuum; (2) knowledge conversion explains, theoretically and empirically, the interaction between tacit and explicit knowledge.
[13] Also the concept of „wicked problems" (Rittel, 1973) has similarities with the afore-mentioned, see Chapter 4.3.2

To sum this chapter up, we can say that the sequential, safe, slow and gradual process of developing an organisation through unfreeze, change and freeze are an insufficient match for the uncertainties of unbalanced markets with sudden punctuations through disruptive technologies (Christensen, 1997; Tushman & O'Reilly, 1996). Sought after are *technologies of change* that support going beyond ingrained assumptions and mental models e.g. through *reframing* (Watzlawick et al.) and that are *second-order* (Watzlawick et al.), or *second-loop* (Argyris).

Nonaka (1994) and Nonaka and Takeuchi (1995) added yet another theory (*organisational knowledge creation)* to compete in the market through continuous innovation. The Eastern scholars criticise some of the above-mentioned Western concepts, which often are being delegated to top executives or recur to development programmes run by external consultants (Nonaka, 1994). They opt against "artificial intervention such as the use of organizational development programs" because nobody from outside the firm knows better or is more able to perform double-loop learning. Out-of-the-box-thinking can be executed through out the organisation. In Western companies, however, it is most often "delegated" to the innovation department – unwittingly creating a disconnection between innovative and creative and the rest of the people inside a company.

2.3 Building Block 3: Innovation and innovation processes

According to the Austrian economist Schumpeter, 1942, capitalism and its waves of *creative destruction* are what drive our economy. He states:

> This process of creative destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in. (p. 83)

In "Capitalism, Socialism and Democracy" (1942) he provided many generations of scholars with the central paradigm of *innovation* as an engine of capitalistic evolution. Creative waves occur in erratic blows causing phases of "revolutions" or "absorption of the results of revolutions" and inducing economic cycles (Schumpeter, 1942). Schumpeter compared this phenomenon with evolutionary theory from biology also calling the cycles "industrial mutations". Schumpeter was of the opinion that capitalism would fail precisely because of the perennial spin creative destruction give to the economy, thus destroying the life of citizens and workers, whole communities, even entrepreneurs themselves.

According to McCraw (2008) who wrote the introduction to the new edition of "Capitalism, Socialism and Democracy", Schumpeter's theory was acknowledged at the time of the first print but not really highly acclaimed. For many years, another scholar of economy, John Maynard Keynes and his "General Theory of Employment, Interest and Money" (1936) caught the attention of scholars and policy makers. It was only during the

90s that Schumpeter's dynamic view of the nature of capitalism moved back central stage. Interestingly, Schumpeter rarely uses the term *innovation*; he mainly writes about entrepreneurship.

Nevertheless, he was the harbinger of the now much bigger field of innovation studies that has grown exponentially since the 50s, including such diverse disciplines as sociology, organisational science, management science, geographic economics etc. (Fagerberg, Mowery, & Nelson, 2005). It comes as no surprise that many different disciplinary approaches to innovation are necessary to understand the topic in depth, since the very nature of innovation is *systemic*. Not only does it involve different stakeholders inside the organisation and the way they organise their innovation activities but these activities also touch stakeholders outside the company such as suppliers, customers, business partners, and other actors of regional and national innovation systems.

Innovation has *characteristics* that make it difficult for many organisations to successfully adopt the concept. The processes are often messy, their outcome is uncertain; innovation activities are often complex and risky. To reduce risks many companies seek out partners; *innovation networks* as well as the *sources of innovation* have been highly discussed lately.

This chapter will focus on a selection of a much broader set of possible topics, since some of them already have been dealt with in earlier chapters such as strategy (Chapter 2.1) and organisational innovation, development and learning (Chapter 2.2). This chapter begins with the *definition*, the *types* the *characteristics* and the *processes* of innovation. There is a short introduction into *innovation processes as management tools*. The *absorptive capacity* construct is presented that explains how external knowledge is being assimilated and exploited during R&D processes.

2.3.1 What is innovation

Bettina von Stamm (2008) defines innovation as a "frame of mind". The reasoning behind her fairly broad definition is that innovation is not only the outcome of a specific activity or a process leading to an innovative result but entails more generally the ability to overcome "existing behaviours, beliefs and mental frameworks" (Von Stamm, 2008). In her view, „innovation is the art of making new connections, and continuously challenging the status quo – without changing things for the change's sake" (p. 10).

Also Schumpeter defined innovation as new combinations of existing resources. This combinatory activity he labelled "the entrepreneurial function". As summarised by Fagerberg et al. (2005) in Schumpeter's early work he mainly described the individual entrepreneur achieving innovation through fighting social inertia or "resistance to new ways" (Fagerberg et al., 2005). Schumpeter (1942) distinguishes the following types of

innovation: new consumer goods, new methods of production or transportation, new markets, and new forms of industrial organisation.

This basic typology is still recognisable in newer categorisations of innovation like the "Ten Types of Innovation" of the American innovation agency Doblin (Kakihara, Durham, & Reposar, 2006):

- *Finance:*
  1. Business model - How you make money.
  2. Networks and alliances – How you join forces with other companies for mutual benefit.
- *Process:*
  3. Enabling process – How to support the company's core processes and workers.
  4. Core process – How you create and add value to your offerings.
- *Offerings:*
  5. Product performance – How you design your core offerings.
  6. Product system – How you link and/or provide a platform for multiple products.
  7. Service – How you provide value to your customers around and beyond your products.
- *Delivery:*
  8. Channel – How you get your offerings to market.
  9. Brand – How you communicate your offerings.
  10. Customer Experience – How your customers feel when they interact with your company and its offerings.

Another often-used categorisation of innovation distinguishes between levels of innovation such as *incremental* vs. *radical* (already introduced by Schumpeter) or *disruptive* vs. *sustained* (Christensen, 1997). While radical innovations may bring game-changing developments such as the car or the airplane, the bulk of economic benefits come from incremental innovations and improvements, Fagerberg et al. (2005) argues. The incremental builds on the radical. Conversely, disruptive innovation (a technology, product or process) will threaten to displace sustained innovation. Christensen (1997) states:

> Disruptive technologies bring to a market a very different value proposition than had been available previously. Generally, disruptive technologies under-perform established products in mainstream markets. (...) Products based on disruptive technologies are typically cheaper, simpler, smaller, and, frequently, more convenient to use. (p. xviii)

Based on types and levels of innovation Von Stamm (2008) develops an innovation-scape by combining the levels of innovation (incremental, radical and disruptive) on a vertical axis and the different types of innovation (product, service, process and business model) on the horizontal axis. Most companies focus on the simple intersection of incremental and product equalling incremental product innovation, a position that can easily be accessed and copied by competitors. More systemic or *architectural* forms of innovation, e.g. the combination of product, service and business model innovation (like with Apple's iPod) will be harder to imitate.

To define innovation properly even more distinctions need to be made: Many definitions (e.g. Fagerberg et. al. 2005; von Stamm, 2008) distinguish *invention* and *innovation*. While invention is the first occurrence of an idea for a new product or process, innovation will bring it to the market (Fagerberg et al., 2005). While inventions may be carried out anywhere (e.g. the university), it will be the resources and the processes of a firm such as its production skills and facilities or market knowledge that will commercialise the novelty.[14] To transform an invention into an innovation that is successful on the market necessitates a different set of knowledge and (entrepreneurial) know-how than to invent (Fagerberg et al., 2005).

There is another ambiguity in the definition of innovation: the one between *creativity* and *innovation*. While in the common use of these two words, creativity and innovation are often used interchangeably, Von Stamm (2008) states that creativity is an essential building block for innovation but not innovation itself. In the past, different explanations about the origin of creativity existed (Von Stamm, 2008). While in the 18th and 19th century it was assumed that the genius of individuals invents and generates exciting new ideas, in the past 20 years, the opinion has been on the rise that creativity can be the result of a team effort (Von Stamm, 2008).

It has also been argued that creativity can be learned (Seltzer & Bentley, 1999). In "The Creative Age", Seltzer & Bentley (1999) describe creativity as 1) the ability to identify new problems rather than depending on others to define them; 2) the ability to transfer knowledge gained in one context to another to solve a problem; 3) a belief in learning as an incremental process, in which repeated attempts will eventually lead to success; 4) the capacity to focus attention in the pursuit of a goal or set of goals.

However, to reap the benefits of creativity there needs to be market implementation, consisting of the three steps of idea selection, development and commercialisation. Using the creativity perspective on innovation raises the questions, which factors hinder or support a climate of creativity inside a company such as encouragement of creativity and autonomy versus pressure or insufficient resources (Von Stamm, 2008).

[14] According to Fagerberg (2005) the so-called ‚linear model' is obsolete today, meaning that innovation is not necessarily directly linked to scientific inventions that have been developed through a University's basic research programme; many companies rather choose, which technologies to adopt based on their believe what will satisfy user needs, and thus has market potential.

2.3.2 Innovation processes and their characteristics

Innovation is a process of *exploration* and *exploitation* of opportunities for new or improved products, processes or services based on an advance of technical practice or change in market demand (Pavitt, 2005). Amongst scholars there has been a dispute on what is triggering innovation more: the technology-push of a company or the demand-pull from the market (Mowery & Rosenberg, 1979). The answer to this question is: These factors are not mutually exclusive. The two elements have to be brought into balance. Therefore, one characteristic of innovation processes is about *matching* what a company has to offer in terms of core competencies and technologies with market demand.

Pavitt (2005) also describes innovation processes as *uncertain* given by the fact that the outcome of the matching process cannot be fully predicted. Innovation often is a trial-and-error process, in which organisational learning and a more and more refined understanding of technology, users and markets will lead to more reliable results. In Pavitt's (2005) view, the innovation process does not unfold with a set of well-defined stages; instead he proposes to divide it in three sub-processes:

- The production of scientific and technological knowledge
- The translation of knowledge into working artefacts
- Responding to and influencing market demand.

The amount of production and translation of scientific and technological knowledge into products and services differs highly from sector to sector. In 1984, he developed a taxonomy showing that the source and the purpose to innovate vary from sector to sector (Pavitt, 1984). Thus, R&D activity is not the only source of innovation[15]. Dosi (1988) studied the *characteristics of search processes* related to innovation. He states the 'solution' of technological problems involves the use of information drawn from *previous experience*, *formal knowledge* (e.g. from the natural sciences), and from *specific uncodified capabilities* or *tacit knowledge*, which are part of the knowledge base of a firm.

Depending on sector or technology, the firm will develop specific research and problem-solving activities, models, and procedures. There might be e.g. differences on how public or how tacit the knowledge is a company draws from. Another characteristic of the search process during innovation activities is its *cumulative* character.

[15] The so-called low-tech industries – low meaning doing little R&D – are sectors where design could play a more important role such as fashion, food, furniture, textiles etc. The EU Commission of Staff Working Document on "Design as a driver of user-centred innovation" (2009) showed that design expenditure is high in industries with high R&D such as the automobile industry. "However design is also prevalent in manufacturing and service industries that have relatively low R&D spending such as furniture and closing. For these industries and others, such as tourism and retailing, design may be an important way to innovate and allow differentiation in the market place" (p. 24).

2.3.3 Sources of innovation, Open Innovation and networks

In "The Sources of Innovation", Erik von Hippel (1988) overhauled the assumption that the engineers of manufacturing firms were the main *source of innovation*. By categorising firms and individuals in terms of the functional relationship, through which they derive benefit from a given product, process, or service innovation, Von Hippel (1988) found that the *functional sources of innovation* were more diverse than expected. Suppliers, competitors and related industries, private and public laboratories, universities, and – last but not least – users are able to benefit from innovations. He even proposed "that know-how trading between rivals is a general and significant mechanism that innovators can use to share (or avoid sharing) innovation-related costs and profits with rivals" (p. 6).

According to Von Hippel (1988) any functional class is a potential source of innovation under appropriate conditions. Analysis of the temporary profits ("economic rents") expected by potential innovators most often allows for predicting the functional source of innovation. He was also the first one to talk about *lead users* as an essential source of innovation. While not all user innovations do have the potential to become a new product or service for a bigger market, a group of lead users in the computer-aided-equipment design area could be identified that did have exactly that, the potential to create a market through their innovation (Von Hippel, 1988).

Von Hippel (1988) stated that his discovery has wide reaching implications: new management tools are of the essence together with new organisational forms. E.g. marketing research has to change to discover the new lead user product/prototype rather than new customer needs. If firms believe that their new product will have to completely be developed and manufactured in-house this will lead to strong R&D departments; however, R&D might not accept novel solutions by external users, a phenomenon that has been named "not-invented-here-syndrome" before.

While Von Hippel put a spotlight on lead-user led innovation, Chesbrough (2003) focused on how to organise innovation and coined the term *Open Innovation* (OI). He maintains that an open form of thinking about innovation is replacing a closed innovation attitude (Chesbrough, 2003). While in the old way of doing innovation companies build expensive R&D departments and further a company's technology inside its labs until market launch, in OI companies will use internal as well as external ideas and internal and external paths to market.

In *outside in processes* companies use external sources of innovation e.g. from universities to complement and speed-up the innovation activities of the in-house R&D team; *in inside out processes* companies sell spill-overs from their R&D activities that do not

match a company's business models to stakeholders outside the company that are more able to commercialise the novelty[16].

In recent decades, the propensity of firms to engage in various other forms of networks or cooperation such as research consortia, joint ventures, strategic alliances or subcontracting has greatly increased (Powell & Grodal, 2005). An increase of cooperation with customers in the development of new products and process has also been identified. The following benefits can come to companies through collaboration in networks: information diffusion, resource sharing, access to specialized assets, and inter-organisational learning.

The advantages of inter-organisational collaborations and networking activities have been described through concepts of social theory as well as through network analysis. One of the most influential scholars from social theory, Granovetter (1973) delivered a fundamental piece of theory to connect interaction in small groups to large-scale patterns, meaning: what happens between individuals does have wider implications for the networks these individuals are part of.

He discovered that so-called *weak ties* between members of a social group are more conducive to diffuse novelty (Granovetter, 1973). Strong ties like in friendships or partnerships, on the other hand, can be characterized as "a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie" (p. 1361). Strong ties relationships are based on the similarity of two partnering people, the flow of e.g. new information will reach less people and travel less far than in weak ties, which have the ability to function as a bridge between individuals and even between networks.

Powell and Grodal (2005) state:

> Networks contribute significantly to the innovation capabilities of firms by exposing them to novel sources of ideas, enabling fast access to resources, and enhancing the transfer of knowledge. (p. 79)

An organisation with thick formal ties with another organisation (e.g. through the collaboration of their R&D departments) is more likely to produce patents because partners were able to develop a shared language and mutual trust. Strong tie collaborations are also more able to transfer tacit knowledge, while networks that are orientated towards co-creation of novel ideas "may succeed or fail on the basis of their ability to convey and transfer ideas that is not easily codified" (p. 79). This raises the question whether networks are able to work on a reliable basis with one another while still maintaining enough openness to engage in novel relationships and novel ideas.

[16] Chesbrough's concept of OI might be relevant for large companies but not so much for SMEs, which often do not perform R&D. Nevertheless, in Switzerland the OI concept triggered an interest in open innovation platforms where inventors and companies meet such as Atizo (http://www.atizo.com).

2.3.4 Innovation processes

According to Verworn and Herstatt (2000) innovation process models are used by the practice to standardise innovation processes as well as by research to *describe* best practice and/or deduct *prescriptions*[17] from it. Thus, innovation processes are *management tools* to structure the operations of innovation management as well as *conceptual models* that reflect different notions of innovation (Robert G Cooper, 1990; Roger G. Cooper, 1996; Hughes & Chafin, 1996; Verworn & Herstatt, 2000). The mental models hidden in innovation process models have changed over the last decades and with it their prescriptions. While the typical stage gate models were and sometimes still are sequential, it is common knowledge today that innovation just like design processes often are iterative not linear.

Models also help to reduce complexity and at the same time are tailored to the specialisation of a trade. They are tools for strategy building as well as for product planning. In the Anglo-Saxon area there have been several generations of process models starting with so-called *phase review processes* that are characterised by the four stages of concept development, definition, implementation and manufacturing divided by management go/no go reviews in between stages (Verworn & Herstatt, 2000). These processes were first used in the field of engineering (e.g. the NASA) and were highly technology-driven. While early phase review processes were able to facilitate the communication between suppliers and manufacturing firms and to standardise the decision-making within innovation processes, there were also disadvantages coming from them. The pace of the processes was slowed down by the sequential order of process steps. Hughes and Chafin (1996) mention that the single phases are seldom fully completed during the stage itself but iterate through out later stages.

Robert G. Cooper (1990) states that companies, which adopt a formal product development process do better at innovation. Since the 80s, Robert G. Cooper started to advocate *stage gate systems*, a second generation of process models followed in the 90s. In his research on innovation processes in companies, he detected a series of recurring weaknesses in new product development (NPD). Particularly industrial-product and high-tech companies gave little attention to the market, to customer needs. They also did little "homework", the preliminary assessment of ideas through initial screening, preliminary market or technical assessment etc. before development, and the quality of the processes was poor.

His models (Cooper, 1990; Cooper, 1996), which are intended to prescribe each step of the way, include five stages with a gate to pass through before moving to the next stage (Figure 3). *Gatekeepers*, multidisciplinary and multifunctional teams with senior members who have the authority to approve the resources for a project, control the

[17] Also Tsang (1997) studied the differences between prescriptive and descriptive models in organisational studies. Both forms of developing models have their shortcomings and actually should be integrated to combine experience from practice (prescriptive) with empirical research (descriptive) (Tsang, 1997).

process. One of the central tasks of the gatekeepers is to maintain strategic overview and ascertain strategic alignment.

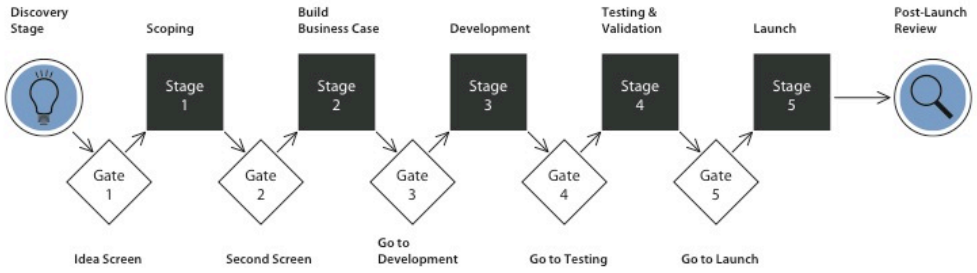

Figure 3: Stage gate process (Cooper, 1990)

Even though the stage gate systems seem to suggest a sequence, in innovation parallel processing is possible or even necessary, meaning multidisciplinary, multifunctional inputs happen concurrently through out the firm (Cooper, 1990):

> A team (not a single runner) appears on the field. A scrum or huddle ensues, after which the ball emerges. Players run down the field in parallel, passing the ball laterally. (p. 50)[18]

Hughes and Chafin (1996) developed a model with the name of Value Proposition Process that claims to go beyond Cooper's process models. In their view, the stage gate system is too bureaucratic and too time consuming. They instead conceptualise innovation processes as "continuous learning, identifying the certainty of knowledge used for decision making, building consensus, and focusing on adding value" (p. 89). The Value Proposition Cycle consists of four loops that grow through iterations over the duration of the process making the outcome of the process more and more certain. The four loops circle around:

- Capturing market value (does the customer care?)
- Developing business value (does the company care?)
- Delivering a winning solution (can the company beat the competition?)
- Applying project & process planning (can the company do it?)

[18] In 1986, Takeuchi and Nonaka called this the rugby approach (Takeuchi & Nonaka, 1986).

Based on prior research, publications, and workshops with many companies, Fueglistaller and Schrettle (2008) from the University of St. Gallen developed an innovation process model for SMEs. While all the above-mentioned models are focusing on new product development and innovation processes in the "narrow" sense of the word, the model (Fueglistaller & Schrettle, 2008) presents an *integrated view* on innovation management (see Figure 4).

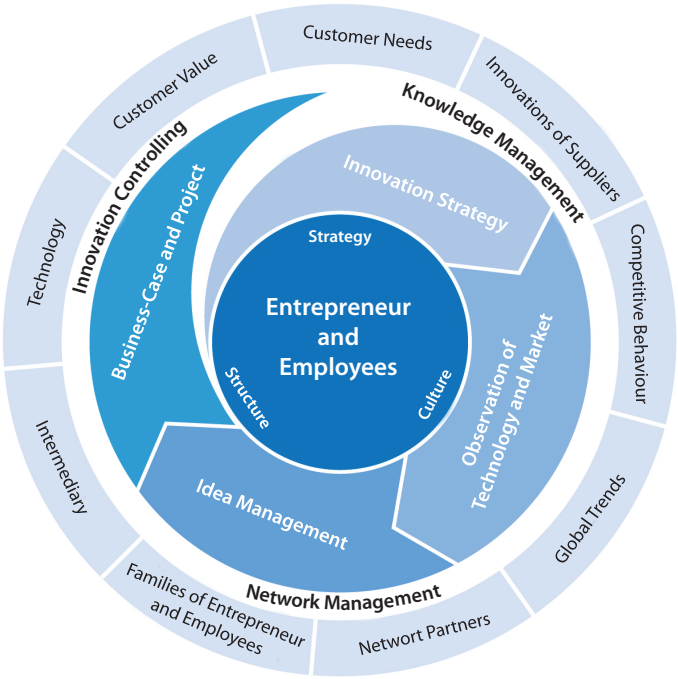

Figure 4: Innovation Process Model (Fueglistaller & Schrettle, 2008)

The company – or more pointedly – the contract between the CEO and his employees determines strategy, structure and culture of the company; the core, however, is in a permanent feedback process with the outer circle of customer's needs, technology, global trends, networking partners and other. The core drives the innovation process through innovation strategy, market and technological assessment, idea management, and business case and project definition. Controlling, knowledge management and network management are supporting this process.

2.3.5 Innovation and knowledge absorption

The ability to absorb external knowledge is critical for a company to innovate. While learning-by-doing refines the existing practice, the acquisition of outside knowledge enables to do things differently. R&D, where traditionally knowledge is produced, has a dual role; not only does it generate new information for process and product innovation,

R&D also develops and maintains the "broader capabilities to assimilate and exploit externally available information" (Cohen & Levinthal, 1989, p. 593).

In 1990, Cohen and Levinthal coined the term *absorptive capacity (ACAP),* it is "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (p. 128)." Although the APAC construct revolves mainly around the acquisition of technological and scientific knowledge through the R&D activities of a firm, other business units such as manufacturing, design or marketing can be named as the beneficiaries of ACAP (Cohen & Levinthal, 1990) [19].

ACAP can best be described through the cognitive structures that underlie learning. Citing insights from cognitive behavioural science Cohen and Levinthal (1990) state, that "prior knowledge confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (p. 128). To build on an already existing memory (of knowledge) reinforces the learning process itself. Conversely, new knowledge might be acquired but subsequently not be utilized well because the individual does not already possess the appropriate knowledge to put it into context. Learning – just as said before innovation in general – is a *cumulative* process.

Cohen and Levinthal (1990) argue that the prior possession of relevant knowledge and skills is what gives rise to creativity, "permitting the sorts of associations and linkages that may have never been considered before" (p. 130). Problem solving and learning capabilities are similar. While learning capabilities involve the development of the capacity to assimilate existing knowledge, problem-solving skills represent a capacity to create new knowledge. *Knowledge diversity* facilitates the innovative process by enabling individuals to make novel associations and linkages.

However, an organisation's absorptive capacity is not the achievement of any single individual inside a company but depends on the links across individual capabilities. New knowledge must actively be exploited by the organisation. Transfer across subunits is necessary as well as a structure of communication between the company and its environment. Cohen and Levinthal (1990) introduce the *gatekeeper* that stands at the interface of both the firm and the environment and between the subunits of the firm; equally important are cross-functional interfaces between R&D, manufacturing, design or marketing.

In 2002, Zahra and George proposed a re-conceptualisation of ACAP "as a dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage" (p. 185). ACAP is being divided into two subsets: *potential* (PACAP) and *realised absorptive capacities (RACAP)*. Potential capacity consists of the ability to acquire and assimilate knowledge, realised capacity

[19] A French study comes to the conclusion that the presence of in-house design teams enables companies to absorb know-how from industrial networks of the regional innovation systems more quickly (Bougrain & Haudeville, 2002).

enables to transform and exploit new knowledge. PACAP makes a company susceptible to learning. RACAP enables the company to leverage PACAP (Zahra & George, 2002).

Zahra and George (2002) reason "that potential capacity provides firms with the strategic flexibility and the degrees of freedom to adapt and evolve in high-velocity environments" (p. 185). Referring to Barney's (1991) concept of the RBV and to the DC concept of Teece et al. (1997), they connect the ACAP construct to the dynamic capability concept by viewing ACAP as a DC that impacts on the resource base of a company provide multiple sources of competitive advantage.

The above-mentioned organisational capabilities build on each other to yield ACAP, "a dynamic capability that influences the firm's ability to create and to deploy the knowledge necessary to build other organisational capabilities (e.g. marketing, distribution and production)" (p. 188).

Zahra and George (2002) propose a conceptual model that captures antecedents of ACAP, ACAP itself as well as the results of ACAP. Antecedents are knowledge absorption from external sources building on *experience* and *knowledge complementary*. Contrary to Cohen and Levinthal (1990) that stressed the importance of prior knowledge in the absorption of new knowledge, Zahra and George (2002) propose that knowledge needs to be related and at the same time different from prior knowledge.

Internal or external triggers such as an organisational crisis, performance failure, technological shifts or radical innovations that occur outside the company activate the absorption of new knowledge. Social integration or the sharing of information contributes to knowledge assimilation and transforms PACAP into RACAP, a process that can be measured by an efficiency factor.

Finally, ACAP will lead to sustainable competitive advantage. Following the concept of the RBV (Barney, 1991) ACAP can be described as "knowledge-based capabilities" that will increase innovation and strategic flexibility. RACAP will impact on product and process innovation.

2.3.6 Summary of building block 3

Since Schumpeter's description in 1942 of the individual entrepreneur fighting social inertia and creating new ways of doing or commercialising things through new combination of existing resources, the definitions of innovation and its central actors have become more complex and more varied. E.g. Von Stamm's (2008) innovation landscape goes from simple forms of e.g. incremental product or service innovations to more complex or architectural forms. Christensen (1997) describes disruptive forms of innovation that in the long run change how people behave (e. g. the internet fundamentally changed our way of communicating).

Also the perception of who exactly innovates has changed (Von Hippel, 1988) and an increasing interest to share knowledge in networks or through knowledge transfer projects has been identified (Powel & Grodall, 2005). With his research Von Hippel (1988) opened the horizon of innovation management to other sources (namely outside the company) and contributed to the notion that much innovation comes from networks. Also OI, the use of internal as well as external ideas for innovation (Chesbrough, 2003), has attracted lots of attention, even though especially SMEs have always been using ideas from customers or other stakeholders to innovate.

The processes how innovations come into reality have been described as chaotic and uncertain (Pavitt, 2005). Nevertheless since the 40s, process models as management tools to standardise company processes or as blueprints to describe these processes have been developed further from sequential to overlapping models (Cooper, 1990, 1996; Hughes & Chafin, 1996). Many authors agree that innovation is at its root an *organisational learning process*. In Dosi (1988) or Lazonick (2005) learning is *cumulative* and depends on the knowledge a company already developed in the past. Cohen and Levinthal (1990) and Zahra and George (2002) investigated in depth how companies absorb new knowledge through the organisational capabilities of acquiring, assimilating, transforming and exploiting new knowledge.

To sum this chapter up we can say, that the capability to innovate in a knowledge-based society with its fast paced markets has grown more important for organisations than ever. At the same time, the image of the "modern" company has become more open for cooperation and permeable to outside influences.

2.4 Building block 4: Design management

The history of design management is strongly connected to the rise of businesses' awareness of design as a value creator. In their often cited paper „Design: A powerful but neglected strategic tool" Kotler and Rath (1984) describe the benefits of using design in the following way:

> Design has been identified as a process that seeks to optimize consumer satisfaction and company profitability through creating performance, form, durability, and value in connection to products, environments, information, and identities. Strong design can help a company to stand out from its competitors. (p. 21)

Many more scholars identified a strong link between design and business success since then. For example Moultrie et al. (2007) summarise the following principal effects of design on value creation: high quality products provide meaningful distinctiveness; design reinvigorates products in mature markets; design communicates value to customers; high growth firms using external design expertise are more positive about product design and

are more innovative; companies that use design are stronger in all aspects of business performance (Moultrie, Clarkson, & Probert, 2007).

But how does a company become more competitive with the help of design? In the past, design management theory attempted to "extract" the contributions of managing design in companies to leverage all the above-mentioned marvellous effects of design. E.g. Chiva and Alegre (2009) researched the relationship between *design management* and company success. Through empirical research in the Italian and Spanish ceramic tile industry these authors were able to verify three hypotheses connecting design management to performance: 1) Design management enhances firm performance. 2) Investing in design is positively related to design management. 3) Design management plays an important role in determining the effects of design investment on firm performance. While investment in design is a primary input to the design process, design management skills are required to carry out that process effectively (Chiva & Joaquìn Alegre, 2009).

According to Chiva and Alegre (2009) this is what can be called the *mediating role* of design management. Recent notions of design management go even a step further, setting design management apart from the outcomes of design processes such as brands, products, or environments to describe design management as a driver of organisational change (Cooper, Junginger, & Lockwood, 2011). More on this topic can be found in the Chapter Responses 4.2 (on design and the organisation).

This chapter, first, looks at the *context* and *history,* in which design management as a practice and as a discipline evolved, and how it *developed* over time. It also touches upon *design thinking,* a recent debate influencing the notion of design management. This chapter provides *definitions, goals* and *roles* of design management described by different authors (Farr, 1965; Gorb, 1990c; Turner & Topalian, 2002). It also talks about the *place* of design management in the organisation (Best, 2006; Borja de Mozota, 2003a; Cooper & Press, 1995; Dumas & Mintzberg, 1989), and finally, introduces the concepts of *design management maturity* (Kootstra, 2009) and *design management capabilities* (Chiva & Alegre, 2009; Kotler & Rath, 1984).

2.4.1 History, context and development of the notion of design management

The origins of design management can be traced back to the early twentieth century (1907-1914), when the German architect Peter Behrens approached the visual appearance of AEG (the German electrical corporation) in a holistic way and designed or re-designed the products, factory buildings, showrooms, graphic materials including e.g. price lists, and even the trademark of AEG (Bürdeck, 2005).[20] Other companies that developed a

[20] There are authors who date the origins of design management back to the construction of the Pyramids or the Arsenal of Venice (Cooper, Junginger, & Lockwood, 2011). However, in this thesis we consider design as

unified corporate design were Olivetti in Italy or Braun in Germany, where in the latter case the designer Otl Aicher was in charge. The first professional design managers were designers and architects that brought a holistic approach to the visual appearance of organisations by aligning the inner and the outer spheres of the company (Bürdeck, 2005). By connecting corporate identity to design, these companies gave rise to what later would be called corporate design management.

In 1965, Michael Farr raised the question "Design Management - Why is it needed now?" In his seminal article he stated that industry and commerce were growing more and more complex and that rules-of-thumb when introducing new products and services in their markets would not suffice anymore. In the sixties, marketing and branding had introduced a fundamental shift in the way a company presented itself and its products/services to its customers. To illustrate Farr made an example of the supplier of ironed shirts who no longer was selling a laundry service but pride in appearance (Farr, 1965). Design had grown more specialised and the training of designers more diverse and profound, which made it a challenge for management to pick the right designer for the right job.

Farr's (1965) rationale behind the need for design management had moved from the unity of all elements of visual appearance achieved by a single "enlightened" architect/designer as described with AEG or Olivetti to responding to strategic preoccupations of companies such as becoming and staying competitive in a complex market environment through increasing efficiency and effectiveness in managing design as a "unique factor" in competition.

In 1990, Peter Gorb, another pioneer of design management proclaimed the 80s as the *decade of design* (Gorb, 1990a). Right after the two world wars, while building up capital, production and productivity occupied the attention of management. In the 60s, however, the behavioural sciences gave way to marketing as a tool to stimulate market demand in a population that was getting wealthy enough to buy more goods and services (Gorb, 1990a).

As observed by Farr (1965) this was the moment when the need to differentiate products, services and appearances through design emerged. In the 70s, competition from Japan started to impinge on US markets and the self-confidence of the American economy. For the first time, leadership also in the use of design came from outside the USA. As a response Gorb (1990a) identified four main management preoccupations to which design would be able to respond:

- Innovation and its process in the search for profits
- Quality and its control of products and services
- Corporate strategy and corporate identity design

a practice originating at a time of the many changes in production in the wake of the industrial revolution. Design management as a practice evolved in parallel or later.

- Procurement of effective education for line managers (p. 72).

Like Gorb (1990a), Borja de Mozota (2003) looks at the context of design management through the lens of management science and history: In her view, design management is rooted in the shift from a hierarchical Taylor model of management to "a flat and flexible organisational model, which encourages individual initiative, independence, and risk-taking" (p. 67). Under these circumstances central contributions of design management to value creation can be: *differentiation* through the customer experience at the touch points of brand, product, packaging, service etc.; *coordination* of cross-functional teams in innovation and new product development, through effective communication, etc.; *transformation* by improving the relationship between company and its environment, anticipating new markets and trends, and enabling change and organisational learning (Borja de Mozota, 2003b).

Both, Gorb (1990a) and Borja de Mozota (2003) propose to familiarise management with design by inserting design in management terminology and using a company perspective on design (e.g. the categorisation of design by Gorb), or introducing design into well-known management frameworks (e.g. the Balanced Design Score Card by Borja de Mozota).

In the early 2000s, however, different scholars and practitioners started to adopt the opposite perspective. They proposed that design is able to make a difference to management because it is different (not familiar). Several threads of a discussion emerged that can be summarised under the headings of *managing as designing* (Boland Jr. & Collopy, 2004; Buchanan, 2004) or *design thinking* (Brown, 2008, 2009; Martin, 2009).

There is one thread coming from the business side critiquing current management practice and striving for new improved forms; there is one coming from the design side aiming at introducing design approaches into business routines. While the first thread as represented by Boland and Collopy (2004) analyses current shortcomings of management practice[21], the second suggests to broaden management practice by incorporating what designers do, or even to become like designers. Advocates of this latter thread are Martin (2009) and Brown (2008, 2009), heavily supported by the Business Week journalist Bruce Nussbaum.

Roger Martin (2009) describes a antagonism between analytical thinking characterised by deductive reasoning and decisions coming from a continuously repeated analytical process, and between intuitive thinking, which resembles a creative instinct with unanalysed flashes of insights. For Martin (2009) these two forms of thinking need to be reconciled and brought into a dynamic interplay to create business advantage. He states that design thinking is balancing reliability and validity, analytical reasoning and intuition, exploration and exploitation.

[21] e.g. the so-called decision attitude as opposed to a design attitude

Tim Brown (Brown, 2008, 2009), a practicing designer, suggests to connect a "designer's sensitivity" (Brown, 2008, p. 86) and a designer's methodology to focus on people's needs as a driver of innovation and business value. This "human-centred design ethos" consists of such elements as empathy with the user, early and rapid prototyping and experimentation, use of process (inspiration, ideation and implementation), collaboration (Brown, 2009) between designers, customer, members from other disciplines of the company and other.

Cooper et al. (2009) put design thinking into the broader context of the development of design management. They identify a *progression* of awareness of design by business and society, going from *emerging* design awareness in the context of manufacturing, to *maturing* design awareness in the context of branding and marketing, to *essential* design awareness in the context of organisation and society. While in the manufacturing context the focus is on the *product*, in the marketing and branding context the focus is on *experiences and services*; finally, in the context of organisations and society the focus now is on the use of *design thinking* and *design methods* (Cooper, Junginger, & Lockwood, 2009).

Many design practitioners and scholars remain sceptical in regard to the latest *design thinking fad* (Hassi & Laakso, 2011; Johansson, Woodilla, & Çetinkaya, 2011). Hassi and Laakso (2011) showed that designers and managers have two different concepts of design thinking by analysing how management scholars absorbed the notion of design thinking. Johansson, Woodilla and Çentinkaya (2011) observe that the managerial discourse about design thinking is superficial and popular, and rarely refers to the design discourse, while the designerly discourse is rich because of its different epistemological roots.

2.4.2 Definitions, goals and roles of design management

Definitions of design management have been in the past and still are today manifold and ambiguous. Nevertheless through time, practitioners ("18 Views on the definition of design management," 1998; Best, 2006) and scholars (Borja de Mozota, 2003b; Cooper & Press, 1995; Farr, 1965; Gorb, 1990b, 1990c; Oakley, 1990; Turner & Topalian, 2002) alike found different ways of characterising a discipline that has been evolving and growing since the beginning of the last century.

Just like with design, definitions and *roles* of design management vary greatly from sector to sector (Dumas & Whitfield, 1990) depending on its organisational place (Borja de Mozota, 2003b; Cooper & Press, 1995; Dumas & Mintzberg, 1989; Mintzberg & Dumas, 1991), on which functions it reports to (Farr, 1965), or on which processes it contributes to (Bruce & Bessant, 2002). Some scholars even go so far as to say that a definition of design management, to which everybody agrees does not exist (Best, 2006).

In this chapter we will introduce three selected definitions from Farr (1965), Gorb (1990) and Turner and Topalian (2002) that illustrate the above-mentioned *development* of design management over time. In 1965, Farr offered the *definition* that design management "is the function of defining a design problem, finding the most suitable designer, and making it possible for him to solve it on time and within a budget" (p. 38).

This straightforward definition of design management depicts design management as a project management activity. It is based on the assumption that like any other business task design needs a specialised function to take care of it. If this function is established, the activities of a design manager unfold in form of a process going from designing requirements for a new product, to finding a designer, briefing her, facilitating the product development process, to setting up a network of communication of all parties involved in the process, to launching the product with the design manager supporting marketing, sales, promotion etc. In Farr's definition the main *goal* of design management is *efficiency* and *effectivity*.[22]

This definition describes a new form of professional that sets itself apart from what Dumas and Gorb (Dumas & Whitfield, 1990; Gorb, 1990a; Gorb & Dumas, 1987) called *silent design*. Several studies found that non-designers such as marketers, engineers, chief executive officers etc. unwittingly make design decisions, design artefacts, or make other contributions to the design process. Gorb (1990a) also acknowledged that this process seemed to work, sometimes better than others. However, the studies on silent design made clear that only the conscious management of design will allow for using design as a strategic tool.

Gorb (Gorb, 1990c) defines design management and its goals as the "effective deployment by line managers of the design resources available to a company in order to help the company achieve its objectives" (p. 2). Compared to Farr, Gorb's (1990c) scope of what design contributes to business is broader. Areas of contributions are products and services, information, environments and corporate identity. While some areas will have to be managed centrally (e.g. the corporate identity of a firm), some other design tasks will be managed in whichever department there is need for it. Some activities of design management are more strategic, some others more operational in nature.

Turner and Topalian (2002) elaborated on these two roles of design management and distinguished *design leadership,* which is *pro-active,* from *design management* that is *reactive*[23]. They state:

> Management is essentially about responding to a given business situation. The basic skill is about facilitating a change process. This is at the core of what design managers do. Leadership, on the other hand, is about describing what the future needs to be like, then choosing the direction to take in order to get to that future. That is at the core of what design leaders do. (p. 1)

[22] A few years later, Alan Topalian came up with an even more detailed framework of a design managers tasks (Topalian, 1979).
[23] Borja de Mozota (2003) introduced three roles of design management: the strategic, the functional and the operational.

While design managers manage people, budgets, timetables, work, and infrastructure and in doing so are concerned with efficiency and effectiveness, design leaders help companies to clarify where they wish to go. Their main tasks are: envisioning the future, manifesting strategic intent, directing design investment, managing corporate reputation, nurturing an environment for innovation, and training for design leadership (Turner & Topalian, 2002). The authors stress that design management, too, has become a complex function and that many design managers today also perform design leadership tasks.

2.4.3 Organisational place of design management

One of the main preoccupations of design management has been the question how and where to implement the management of design in an organisation. Should an external design consultant do it or should this function be built inside a company (Topalian, 1979)? Borja de Mozota's (2003) main interest is in-house design management; she posits that it should be concerned with the formal implementation of a programme of activity within the organisation by communicating the relevance of design and by coordinating design resources at all levels of the corporation.

Design should be introduced *gradually*, *responsibly* and *deliberately* into a firm. *Gradually* means that trust in the value of design can be build up by going through pilot projects; *responsibly* means that a supportive senior manager promotes design and gives top-down directions for the implementation of design as a strategic resource. The introduction of design management is also *deliberate* since the communication between function and divisions, or between organisation and designers etc. must be established.

Similarly, Mintzberg and Dumas describe five different approaches of "managing design – designing management" (Dumas & Mintzberg, 1989). A company can use the *champion approach,* which resembles the responsible form of implementation described by Borja de Mozota (2003), and in which a senior member of an organisation acts as promoter of design. Organisations can implement a *design policy,* a formal document to which all management functions will have to adhere. A *design programme* formalises the design processes of specific areas such as the corporate identity design or new product development of a company, sometimes introduced by the design audit of a consultancy that is able to kick-off organisational development. In the *design function* approach a specialised department is created to "look after design" (p. 40).

However, to draw up a box in an organisational chart can be a formality with little influence on daily operational activities and on the culture of an organisation. That is why Mintzberg and Dumas (1989) state that the fifth approach of *design infusion* will be the most effective: Infusion can be achieved if design becomes everybody's business - not

delegated to a champion, a formal policy, a more or less sustainable programme or to a specialised function. Design infusion is informal and permeates all company's activities.

Gorb (1990c) is of the same opinion: "Any large complex corporation is likely to manage its design activities in a number of ways and at different places in the organisation with differing reporting responsibilities" (p. 8). He compares the infused state of design to computing; at the time of its introduction it was a black box to managers. However, today, IT skills permeate a company. The same could be true for design and design management skills if line managers were trained properly.

Other categorisations of the organisational place and the implementation of design management can be made, e.g. by describing its relationship to other business processes such as strategy building, marketing, operations management, organisational behaviour, finance and law (Bruce & Bessant, 2002) or by relating it to other business functions such as marketing, human relations management, finance, product development, sales, research and development (Cooper & Press, 1995).

Best (2006)[24] distinguishes three organisational levels to implement design management: 1) strategy, policy and mission, 2) tactics, systems and processes, and 3) operations, tangibles and touch. Cooper and Press (1995) make a similar distinction between board and top (level 1), middle and business function (level 2) and design activity and function (level 3). By listing key aspects of the design management process on one axis and the levels of the organisation on the second, Cooper and Press (1995) develop a *design management matrix* of issues to address.

Finally, where and how design management is implemented in a company is highly dependent on the trade, the company's objectives and (as we will see later) the size of the organisation.

2.4.4 Design maturity and design management capability

Design maturity and *design management capability* frameworks are useful to 1) assess design integration of organisations from an outside view e.g. with the intention of comparing companies with one another, and to 2) discuss the present use of design and the understanding of the potential of design as an innovation driver with company staff members. These frameworks conceptualise or even visualise[25] design and design management in a way to make it feasible to decisions makers, members of NPD, marketing teams etc. and to give indications on how to achieve a higher form of design management or design process maturity.

[24] Best adapted a model from Sean Blair, Spirits of creation (Best, 2006, p. 17).
[25] An example of a visualised design maturity tool is the „Design Management Travel Guide" from prior research of the author of this thesis (Acklin, & Hugentobler, 2008). See Appendix.

The Danish Design Ladder (see Figure 5) is an example of such a framework; it facilitates the assessment of the *overall design maturity* of a company, in this case using a four-step model. *Design maturity* and *design management capability* frameworks like the one above are useful to 1) assess design integration of organisations from an outside view e.g. with the intention of comparing companies with one another, and to 2) discuss the present use of design and the understanding of the potential of design as an innovation driver with company staff members.

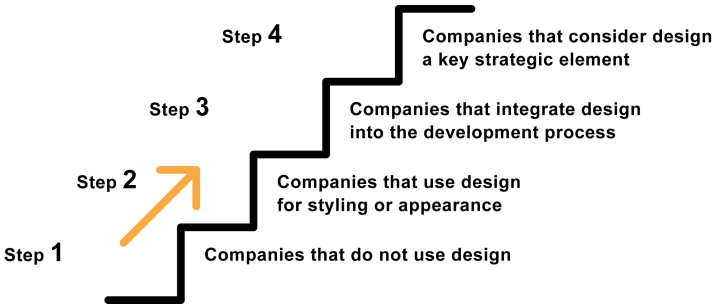

Figure 5: Danish Design Ladder (2003)

Based on the Danish Design Ladder (see Figure 5), Kootstra (2009) developed a Design Management Staircase (see Figure 6), which explicitly focuses on the *maturity* of design management rather than on the use of design. The staircase is also a four-tier model, but besides the four steps it includes five factors: awareness, planning, resources, expertise and process to complement the model.

The levels are:

- Level 1 – No design management: On this level companies do not or rarely use design as a differentiator
- Level 2 – Design management as project: These companies use design on an ad-hoc basis, mainly as a marketing tool but not as adding value through new product and service development
- Level 3 – Design management as function: Early involvement of design into product and service development processes takes place and specialised expertise for innovation is deployed where needed
- Level 4 – Design management as culture: Design is "a way of life" in these companies

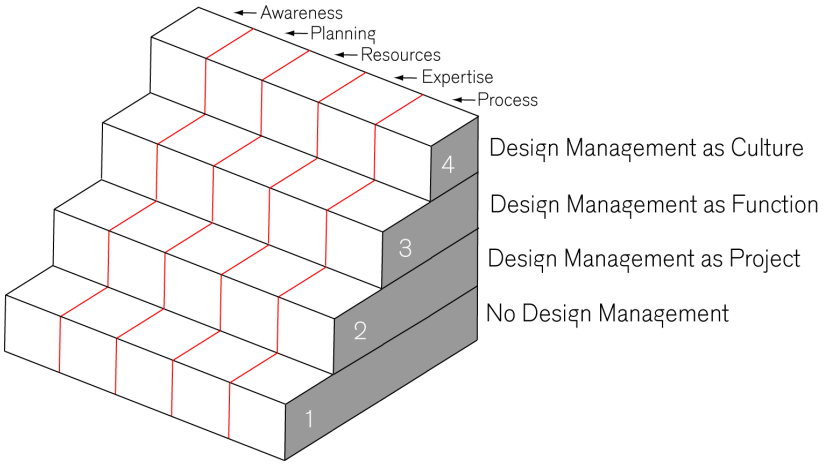

Figure 6: Design Management Staircase (Kootstra, 2009)

While the above mentioned ladder frameworks implicate that there are steps to be climbed to become more and more mature in the use of design as a company, Kotler and Rath's (1984) categories of *design sensitivity* and *design management effectiveness,* describe *design management capabilities* as abilities related to design management. Kotler and Rath (1984) made a distinction between the use of design and the use of design management, which is often blurred if made at all. *Design sensitivity* assesses, to which extent design is part of the marketing decision making process, to which extent design is being utilized in product development, in the design of environments, of information, and corporate identity. *Design management effectiveness* is concerned with the overall orientation of a company's design staff.

Chiva and Alegre (2009)[26] propose the following levels of *design management skills* with rating on a Linkert scale:

- *Basic skills* include managing basic activities of the design process like designing high quality, manufacturability, designing and launching products faster, and low cost.
- *Specialised skills* entail abilities to manage activities like cost estimation of new products, to use the latest computer-aided design tools, to test manufacturability of new products during the design process, and to find people with excellent design skills.
- *Involving Others* includes the skill to involve customers and suppliers in the design process and getting new product ideas from customers.
- *Organisational Change* is about the ability to change the way things have traditionally been done in a company; it also contains getting different

[26] Chiva and Alegre (2009) used a skill set developed by Dickson et al. (Dickson, Schneider, Lawrence, & Hytry, 1995), which derived categories empirically from 200 telephone interviews with CEOs of high growth SMEs in the US. CEOs self-assessed their design management skills.

> functions in the firm to work together or replacing sequential with concurrent design.

2.4.5 Summary of building block 4

Since Farr's article in 1965, the definitions, goals and roles of design management have moved and still are moving upstream, starting from design project management, to more responsibility in managing design as a strategic resource by deploying it throughout the company, and even further to embrace leadership by envisioning the future of an organisation. However, already Farr (1965) mentioned that a design manager should be directly reporting to the managing director and have equal status with other senior executives to allow for a design policy to have impact on all company's activities.

Thus, to sketch the history of design management is virtually impossible, because early authors of design management theory are still important today and many different forms of using design management in organisational settings co-exist in parallel. Cooper et al. (2009) state:

> There are some who see new opportunities as design moves from lower-level product centred design strategies to the complexities involved in designing business processes and customer touch-points on the organisation level. Not surprisingly, this shift is accompanied by some anxiety about what design management is and is not, what it should or should not be. (p. 50)

Cooper et al. (2009) argue that the debate about design thinking has helped to raise awareness of design management at all organisational levels and has created a clearer picture of what design management is and could be.

We would like to end this chapter with a visualisation of design management, something rare in design management theory. The Integrated Design Management Model from prior research (Acklin, 2009) connects concepts from different authors using Anthony's Triangle. It is labelled "integrated" because there has a lot of coordination, alignment, communication, education and even mediation between conflicting forces in the company to be done before design can fully unfold its power as a value creator.

The categories of the model (see Figure 7) connect to the topics covered in this chapter: organisational levels (Best, 2006); roles (dimensions) of design management (Turner & Topalian, 2002); central processes of design management (Bruce & Bessant, 2002; Cooper & Press, 1995); and also Borja de Mozota (2003) not mentioned in detail in this chapter; tasks of design management of planning, coordinating/aligning and infusing (Dumas & Mintzberg, 1989); design and design thinking; touch point orchestration or the goal of design management: creation of a coherent experience for customers and stakeholders (Cooper, Junginger & Lockwood, 2009).

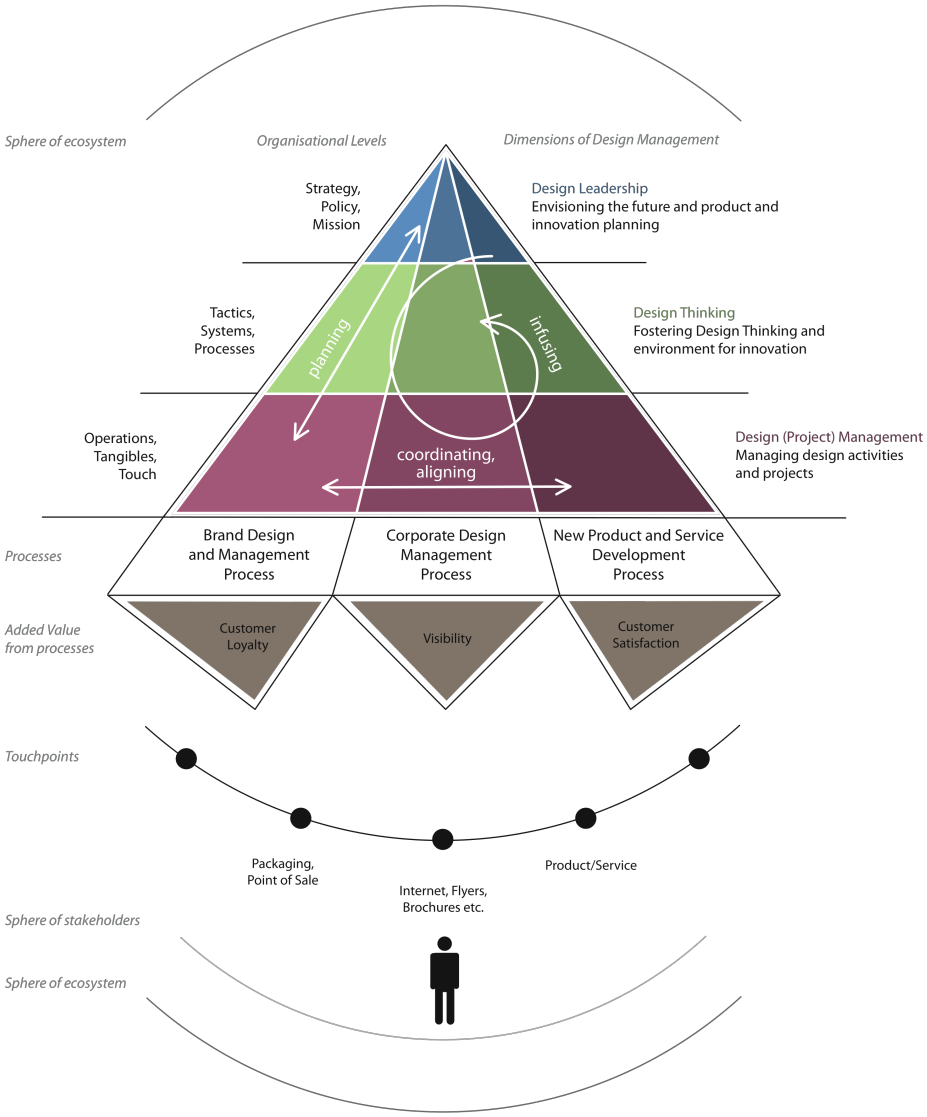

Figure 7: Integrated Design Management Model (2009)

3 Characteristics and orientation of SMEs

In all of Europe 99% of all companies or 23 million are SMEs (Audretsch, Van der Horst, Kwaak, & Thurik, 2009); in Switzerland the proportion is even a little bit higher with 99.6% or around 310'000 SMEs in 2008[27]. In Europe, SMEs provide 65 million employees with work; in Switzerland two thirds of all jobs are being provided by SMEs. Under these circumstances, the viability and financial soundness but also the innovativeness of these companies is of great importance to regions, countries and communities of countries like the EU. This is also why governments closely monitor the state of SMEs through innovation surveys or support them through national policies.

According to Pleitner (as cited in Fueglistaller, 2004) there are three main reasons for the importance of SMEs for national economies: 1) in all highly developed countries the service sector dominates the picture; that's where smaller companies reign. 2) Despite of their size SMEs are highly productive. 3) In a small organisational unit the individual is appreciated more and does not disappear in the indefinite mass. In some sectors SMEs are also very innovative, one reason is their agility and their ability to adapt (Fueglistaller, 2004).

This is why small and medium-sized companies (SMEs) are considered central for the economy. However, whether SMEs are really the most important factor of an economy is not completely clear and there are scholars (Arvanitis & Hollenstein, 2004; Fueglistaller, 2004) who offer a more differentiated view on the topic. Also: SMEs greatly vary in form, size and orientation.

This chapter will begin with the introduction of a *definition* of SMEs and their economic impact using *European sources*. Since the action research part of this thesis was conducted in Switzerland, we secondly will integrate *Swiss sources*. To attain a more in-depth understanding of SMEs, this chapter also looks at the *characteristics* and *entrepreneurial orientation* (EO) of SMEs asking questions such as: How are SMEs organised and how do they build their *strategies*? How do they innovate, which innovation processes do they use? How do they use *design* and *design management*?

3.1 SMEs in the European Union

According to the European Commission, Directorate General of Enterprise and Industry companies qualify as micro, small and medium-sized enterprises if they fulfil the criteria laid down in the Recommendation 2003/361/EC (EU, 2003). It further says that in addition to the staff headcount ceiling, an enterprise qualifies as an SME if it meets

[27] http://www.bfs.admin.ch/bfs/portal/de/index/themen/06/02/blank/key/01/groesse.html (accessed 14.2.2012)

either the turnover ceiling or the balance sheet ceiling, but not necessarily both (see Table 2).

Table 2: Definition of European Commission, Directorate General of Enterprise and Industry

Enterprise category	Headcount	Turnover	or	Balance sheet total
medium-sized	< 250	≤ € 50 million		≤ € 43 million
small	< 50	≤ € 10 million		≤ € 10 million
micro	< 10	≤ € 2 million		≤ € 2 million

This definition has been in use in Europe since 1 January 2005 and instrumental in attributing various advantages to SMEs like access to venture capital or government support. The need for a common definition had come up to "ensure consistency and effectiveness of those policies targeting SMEs and, therefore, limits the risk of distortions of competition in the Single Market" [28].

SMEs are an important part of the European economy, being primarily responsible for wealth and economic growth, next to their key role in innovation and R&D. They are said to be a major source of entrepreneurial skills, innovation and employment. 2008, a SME Performance Report has been launched monitoring the progress of the "Small Business Act for Europe", which aims at improving „the overall approach to entrepreneurship, to irreversibly anchor the 'Think Small first' principle in policy making from regulation to public service, and to promote SMEs' growth by helping them tackle the remaining problems which hamper their development" (Website of the European Commission[29]).

The first annual report (Audretsch, van der Horst, Kwaak, & Thurik, 2009) came to affirmative conclusions concerning the importance of SMEs for the European Union. According to Audretsch et al. (2009) SMEs account for a significant amount of European work experience and economic activity and make an important contribution to the dynamism and innovative performance of the economy.

The report states that from the 20 million SME, 92% are micro enterprises, companies with less than 10 employees. Most new firms created in the service sector are micro enterprises. However, SMEs have a lower labour productivity than large enterprises and add only 58% value to the economy as compared to 67% in employment; labour productivity is actually lowest in micro enterprises.

[28] http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/index_en.htm (retrieved 13 May 2010)
[29] http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/index_en.htm (retrieved 13 May 2010)

3.2 SMEs in Switzerland

In Switzerland, an official definition of SMEs does not exist (Bericht des Bundesrates, 2007). For statistical publications the European framework (see Table 2) is being used. Unlike in the European Union, little financial aid is being offered to Swiss SMEs from the government. This is why a formal definition of SMEs is not needed. The Swiss Government prefers to use specific indicators for specific problem areas. It has – one could say – a user-centred approach to supporting SMEs and has tried to provide specific solutions and instruments for the needs of different target groups inside the larger population of SMEs such as start-ups, companies needing financial aid, companies having difficulties to find a successor (quite a big problem in Switzerland), or export-oriented companies (Bericht des Bundesrates, 2007).

In 2004, a similar report to the one of Audretsch et al. (2009) for the EU was conducted. Arvanitis and Hollenstein (2004) researched the question whether Swiss SMEs are really the backbone of the economy. Departing from the hypothesis that SMEs are not a homogenous group they first identified dynamic sectors within the group and divided SMEs into 5 sectors comprising a high-tech and low-tech sector, a service sector divided into modern and traditional service providers, and a fifth area, the construction sector. For all five areas productivity and employment trends were analysed.

Arvanitis and Hollenstein (2004) came to the conclusion that big and medium-sized companies do have a higher productivity than small firms. The same holds true for the trend to employ more staff. However, in sectors that overall display the highest forms of productivity big companies show less growth in employment numbers than small and medium-sized companies. It can be said that in Switzerland overall big firms are more productive but SMEs from knowledge- and technology based areas such as the high-tech or modern service sector are as productive if not more productive as big companies. These "high performers" amongst SMEs constitute about 29% of all SMEs (Arvanitis & Hollenstein, 2004).[30]

Statistically SMEs dominate in number, but if one compares their market power or positioning to large organisations they are unimposing (Fueglistaller, 2004).

> Most small and medium-sized enterprises are neither leaders dominating the market neither are their entrepreneurs ultra-rich captains of the economy. Nevertheless, SMEs are present in all markets and can be characterised by their flexibility and agility. (...) Only the symbiosis between large and medium-sized companies in a good and highly competitive market together with the quality of the location creates the backbone of a single economy. (p. 5)[31]

[30] The "Bericht Walker" (2007) puts the results of Arvanitis and Hollenstein (2004) into perspective: The report did not include micro firms neither start-ups, which are important drivers of economic dynamism.
[31] The author of this thesis translated all German quotes.

At times, SMEs and big companies form "symbiotic" relationships. In the area of capital goods SMEs often are the suppliers of parts or of semi-finished products to big companies. In relation to R&D activities, big companies are more productive because they out-perform SMEs with their financial and human resources but SMEs do make inventions as evidenced by the big number of patents being filed each year and they are able to develop these inventions into products and services. Although the market share of SMEs of big markets is small, they are able to hold a strong positioning in niche markets because of their regional or national focus and because of their size.

According to Keupp and Gassmann (2009), who researched the Open Innovation behaviour of Swiss companies, Switzerland's innovation structure is highly characterised by regional clusters closely located near foreign countries such as the pharmaceutical industry in Basel, which is close to Germany and France or the life science companies, which are located in the Geneva area close to France. The authors maintain that Switzerland has a highly open and liberal economy and has been a pioneer nation with respect to the internationalisation of R&D (Keupp & Gassmann, 2009). However, in these urban areas more large companies can be found than in rural areas; SMEs dominate there but in part are detached from the bigger innovation clusters, a fact, which the Swiss Government lately has been responding to by the so-called New Regional Policy.[32]

3.3 Characteristics of SMEs

In the face of their sheer mass, Fueglistaller (2004) describes SMEs with the two contrasting attributes of *dominant* and *unimposing*. Because of their size SMEs are also more *agile* and *flexible* than large companies. By being close to their markets many SMEs sustain close relationships with their customers, are able to serve either niche markets inside a specific geographic region or markets with a high specialisation. SMEs are able to produce their offerings individually and geared to the wishes of customers but they have small product portfolios with little diversification (Fueglistaller, 2004).

Many SMEs will also sustain close relationships with their employees, because their loyalty, their professional abilities and motivation are an important asset, and because communication channels work well. The contact between leader and employees is informal, the structures as well as their processes are not very formalised. An important *characteristic* of SMEs is the strong position of the entrepreneur with his specific personality and interests. He might not be using strategic management tools but, nevertheless, act strategically. He often relies on a personal network of customers, stakeholders and suppliers but will try to stay independent with his company.

[32] Neue Regionalpolitik (NRP), see also: http://www.evd.admin.ch/themen/00129/00164/index.html?lang=de (retrieved November 2010)

Fueglistaller (2004) in Table 3 makes the following comparison of qualitative characteristics of SMEs and large organisations.

Table 3: Comparison of characteristics of SMEs and large organisations (Fueglistaller, 2004)

SME	Large Organisation
Owned by entrepreneur	Manager
Managerial knowledge is lacking	Well funded managerial knowledge
Technical education (of owner)	Good technical knowledge available in departments or staff
Insufficient information technology	Developed and formalised information technology
Patriarchal leadership style	Leadership by management principles
Rare group decision making	Often group decision making
Big importance of improvisation and intuition	Little importance of improvisation and intuition
Little planning	Extensive planning
Entrepreneur overloaded by many functions; if there is any division of labour then related to individuals	Division of labour issue-related
Immediate participation of entrepreneur in company life	Distance of management to company life
Few alternatives to correct a wrong decision	Good alternatives to correct a wrong decision
Leadership potential cannot be exchanged	Leadership potential can be exchanged

3.4 Strategy building in SMEs

In Mintzberg's (1996) view, the *entrepreneurial organisation*, which he also calls the *simple organisation,* is the closest to the one of a SME (see also Chapter 2.2.1.). In these organisations decision-making and strategy building are *flexible* and *centralised* and the creation of strategy tends to be *highly intuitive*, often oriented to the aggressive search for opportunities (Mintzberg et al., 1996). Thus, the resulting strategy reflects the chief executives implicit vision of the world, since the leader is most likely also the owner of the company. "It is a personal vision, a concept of the business, locked in a single brain" (p. 594).

The personal vision of the entrepreneur might be bold but in a controlled way stemming from a detailed knowledge of the business and namely its customers. This strategic vision is being reformulated "en route" if need be and backed up by a careful and personally controlled implementation of it. Through the long-term commitment of the owner/entrepreneur the knowledge is concentrated and stored in the mind of this one person which is a strength as much as a weakness of an entrepreneurial organisation.

Also *innovative organisations* or adhocracies (also see Chapter 2.2.1.) can be small or medium-sized and often belong to the dynamic sectors of SMEs as described by Arvanitis and Hollenstein (2004). Strategy building in innovative organisations is very different; this configuration does not spend much time with formulating explicit strategies. Decision-making "flows to everyone with required expertise, regardless of position" (Mintzberg et al., 1996, p. 691). Managers need to masterfully handle human relationships using negotiation, persuasion, and coalition to fuse differing viewpoints. Top management's main task is to build links with the environment becoming more or less a "wandering" sales person trying to acquire new projects for the company. To rely on deliberate strategy would be difficult because the innovative organisation is never sure where its next project is coming from.

Strategy building proceeds incrementally, also because any separation of planning from execution, formalisation from implementation would impede the flexibility of the organization. Contrary to common strategic management lore, adhocracies seem to be able to survive without any strategic focus and thrive on what Mintzberg (1996) calls a *grass-roots model* of strategy formation. "Strategies grow like weeds in a garden, they are not cultivated like tomatoes in a hot house " (pp. 697). There is much anecdotal and scientific (Fueglistaller, 2004) evidence that many owners of SMEs – having a specialisation in one area of expertise such as engineering or biochemistry – do not have much formal management training. They are practicing the "grass-roots model" of strategy formation.

3.5 Innovation and innovation processes in SMEs

Many entrepreneurial organisations do not stay aggressive or innovative in the Schumpeterian sense of the word. One could say that some companies actively scan the environment for business opportunities while others just want to "make a living" for their owner and his employees. The concept of *Entrepreneurial Orientation* (EO) is a helpful one to distinguish the more aggressive from the more reactive organisations.

Since the 60s several scholars developed the notion of EO; Lumpkin and Dess (1996) defined the term in its presently accepted form. It consists of five different dimensions or of a bundle of management attitudes and strategies (Lumpkin & Dess, 1996). These dimensions are:

- Innovativeness: the effort a company makes to constantly develop new products, services or processes through experimentation and R&D-activities
- Risk taking: the propensity of companies to invest into calculated risks in new and uncertain business endeavours

- Autonomy: the independent action of an individual or a team (without any stifling constraints) in bringing forth an idea or a vision and carrying it through to completion
- Pro-activeness: the active search for new business opportunities to produce competitive advantage
- Competitive aggressiveness: the propensity of a firm to engage directly into challenging competitors and rivals on the marketplace.

EO is not a notion reserved to SMEs but can as well be applied to them. A survey of the University of Berne (Baldauf & Rank, 2005) analysing the EO of 108 Swiss internationally active SMEs came to the conclusion that overall EO is low; only 38% of the companies score above average on *pro-activeness* and 37% on *competitive aggressiveness*. Risk-taking is low and innovativeness lower. The authors state that the propensity for EO is influenced by the attitude of the top manager/owner. On the other hand, the disposition for EO grows with the access to resources like capital (equity or credit lines) or social capital like management competencies in the areas of acquisition, strategy development and leadership.

Companies that operate in highly dynamic and complex markets show higher scores of EO compared to companies that act in stable markets. Their reasons to act in an entrepreneurial manner lies in their interest for technological and product innovation. This result is quite similar to the results quoted in Chapter 3.2., the Arvanitis and Hollenstein (2004) report.

Another study (Zellweger & Sieger, 2010) from the University of St. Gallen analyses the EO of long-lived family firms. Considering the fact that 36% of Swiss companies have been founded before 1945 and have been able to successfully stay on the market for 65 years and even more makes this is an interesting category of SMEs[33]. Zellweger and Sieger (2010) studied three Swiss firms between 80 and 175 years old and interviewed thirteen of their top echelon firm managers. Amongst other findings they came to the conclusions that these firms display constantly high levels of external autonomy across time.

As later generations join, there is a shift towards a more participative leadership style. Levels of outward and inward oriented innovativeness fluctuate across time and are being influenced by generational changes. Pro-activeness fluctuates over time with periods of a „wait and see" attitude interspersed with selected proactive moves. The stronger the influence of family shareholders not involved in daily business, the lower the level of pro-activeness and competitive aggressiveness decreases over time due to reputation concerns of the controlling family.

[33] As mentioned earlier, 99.6% of Swiss enterprises are SMEs, only 0.4% are large companies; furthermore, a large portion of the 99.6% are family-owned. A study of the St. Gallen University (Frey, Halter, & Zellweger, 2005) found out that 88% of businesses in Switzerland are family-owned. 36% of these family-owned businesses have been founded in 1945, thus have been successful on the market for more generations.

Overall Zellweger and Sieger (2009) come to the conclusion that the dimensions of EO do not sufficiently capture the full extent of behaviours of long-lived family firms. They maintain that long-lived family firms use *equifinality*, which means that these organisations utilise different orientations – some more, some less entrepreneurial - to reach their objectives and achieve wished for outcomes. By saying so, Zellweger and Sieger (2010) challenge the commonplace assumption that only aggressive entrepreneurship keeps companies alive.

The most striking feature of innovation processes in SMEs is the closeness to their customers. A German study (Rüggeberg & Burmeister, 2008) researched the characteristics of innovation processes of 15 mostly technology-driven SMEs from trades such as medicine, software, chemistry, electronics, plastics and engineering. 6 of the 15 companies were micro enterprises, 4 employed around 50 and 5 around 250 employees. While bigger companies are able to invest into market research before embarking in technological feasibility studies, especially micro enterprises, after a short period of technological feasibility assessment, set out to do what the customer commissioned. Since the senior managers of technology-driven companies are trained in the area of the business' expertise, communication with customers comes easy. To insure quality the senior managers keep the customer involved during the process.

Overall, Rüggeberg and Burmeister (2008) state that there are few structured innovation processes in the researched sample of SMEs. In all of the companies there is little time and space for creative thinking or brainstorming. Ideas come from visits to trade fairs, from public talks, from "old" projects that could not be realised before, from inspiration out of magazines, and from the contact to higher education institutions. Actually 20% of innovations were developed together with universities.

According to Rüggeberg and Burmeister (2008), during the process of preliminary (market) research, the participation of employees is handled very differently. Most of the times, the owner will stay highly involved, sometimes slowing down the process because of limited time resources. Due to limited resources the processes tend to be sequential rather than in parallel, going from project initiation to prototyping as soon as possible, including extensive internal and external tests of the prototype. Often a systematic and software controlled project management is missing. However, the flexibility and short internal communication processes of SMEs mitigate the lack of methodology and project management.

3.6 Design and design management in SMEs

A recent survey (Kootstra, 2009) commissioned by the ADMIRE (Award for Design Management Innovating and Reinforcing Enterprises) programme studied the incorporation of design management practices in European SMEs using the afore-

mentioned Design Management Staircase (see Chapter 2.4.4). 605 companies, a group of experienced and active design users from the eight countries of UK, Austria, Germany, Luxembourg, The Netherlands, Portugal, Spain and Turkey completed a valid online questionnaire. Kootstra (2009) reports that:

- Most often cost factors are a barrier to design management; also lacking knowledge and culture represent a block to the adoption of design management.
- Awareness of design as a value creator and the right expertise will foster the adoption of design management.
- High-turnover companies with over 25 million often score higher when it comes to the level of adoption of design management; the more the company invests in design the higher it scores on the design management staircase.
- In a number of cases, large companies have higher levels of company ratings, which means that size matters for the adoption of design management.

A few years before in 2003, Borja de Mozota studied the use of design and design management of 33 European SMEs, which had been selected in their respective countries for the excellence in the design of their products. They all had been nominated for the European Design Prize. While this study (Borja de Mozota, 2003a) documented the excellence of design management in design-driven SMEs in the areas of product design, packaging and graphic design, or environmental design, it is not representative for most other SMEs, which rarely tap into the potential of design as a strategic resource.

The Commission Working Staff Document of the EU (2009) makes the following fundamental observation: Because of its broad nature design is an often-difficult concept to grasp for SMEs.

> In economic terms, design services are 'experience goods', i.e. a product or service whose characteristics (such as prize or quality) are difficult to observe in advance, but these characteristics can be ascertained only on consumption, in contrast to a 'search good'. This is particularly the case when design services are bought from a designer for the first time. (p. 55)

Bruce, Cooper and Vasquez (1999) observed the following obstacles to design: SMEs fear the potential cost of employing professional designers; they are unsure about the commercial outcome of design investments; senior management does not commit to a design approach; projects suffer from poor financing and insufficient funds to cover costs; incomplete design briefs that fail to include user needs, pricing strategy etc. will produce mediocre results; and design competencies are sourced in an inappropriate manner (Margaret Bruce et al., 1999).

The authors found that design skills positively affect business performance but design needs to be managed effectively through design management expertise in sourcing, briefing and evaluating design. They come to the conclusion that "small companies have a range of business needs for design, but have varying levels of awareness and competency to manage design effectively" (p. 315). There is the *confident* and the *apprehensive* type of design user. Confident users had former experience with design; the apprehensive users had little awareness of design.

Moultrie et al. (2007) state that in SMEs design skills are often marginalized. Summarising other authors Moultrie et al. (2007) list the following phenomena in regard to the use of design: product design is badly understood in SMEs; these companies are "design illiterate" and overemphasise engineering at the expense of use and visual appeal; there are unfounded prejudices and tradition bound behaviour by senior management, or previous experience with designers have produced inappropriate solutions.

3.7 Summary

If we sketch the profile of a "typical" SME, we can detect certain *strengths* and *weaknesses*. According to Fueglistaller (2004) the *former* are: SMEs not only exist in a huge variety of forms, they are also able to adapt and change their form in an non-bureaucratic way according to changes in the environment, in customer needs or technology, etc. Internal communication is fast and easy, decision making as well. Being small is a competitive advantage, if the company is fit to act on impulses from the ecosystem. Key to the innovativeness of a SME often is the personality of the CEO together with a committed and qualified staff with which participation in information, decision-making power and the success of the company is shared.

Weaknesses of SMEs are the lack or the difficult access to financial resources, especially if technological change is needed. SMEs have little bargaining power and will get supply or other resources at worse conditions than big companies. Distribution channels are weaker than those of large organisations and often SMEs will not be free to choose the distribution channels they like. General conditions like bureaucracy, difficult to implement regulations etc. will affect SMEs more profoundly than bigger companies. In Switzerland, a critical factor is also the question of finding the right successor for a company. Only about 25% of SMEs will go from a parent to a son or daughter (Fueglistaller, 2004, p. 30); 25% will go to non-family members, 25% will be sold and another 25% of SMEs will shut down. Finally, the personality of the entrepreneur can be a disadvantage as much as a source of strength.

How SMEs handle design and design management is highly depending on prior knowledge. Design-driven companies are able to deal with this specific company resource (Borja de Mozota, 2003), while SMEs from other trades display difficulties (Bruce,

Cooper, & Vasquez, 1999). Because of limited resources a design management function or in-house design team is not common practice in SMEs. However, the dependence on the external knowledge (of designers) and the lack of know-how how to handle it leads to poor results, which reinforces stereotypes about design being to costly and to difficult to manage. In recent years, different national programmes such as Designing Demand[34] in the UK, Innovation By Design[35] in Ireland, Design 2005 in Finland[36], or Better By Design[37] in New Zealand have been promoting the value of design and supporting companies to adopt it. Another vehicle of introduction of design approaches and capabilities to SMEs are knowledge transfer and applied research projects between universities and companies.

[34] http://www.designingdemand.org.uk/ (retrieved 3 Dec 2010)
[35] http://www.designinnovation.ie/ (retrieved 3 Dec 2010)
[36] http://www.seeproject.org/casestudies/Design%202005! (retrieved 3 Dec 2010)
[37] http://www.betterbydesign.org.nz/default.aspx (retrieved 3 Dec 2010)

4 Responses

The chapter *Responses* of the literature review connects the building blocks of *strategy* (2.1)*, organisational theory* (2.2), *innovation studies* (2.3), to selected topics of *design (management) studies.* One could say that *design knowledge* is being injected into some of the above-mentioned concepts of *strategic management, organisational and innovation studies*, and vice versa *design management* (2.4) is being connected with the *absorptive capacity construct* of innovation studies.

Where appropriate the *Responses* are also connected to the orientation and characteristics of SMEs (Chapter 3). By doing so the contributions of design and design management to innovation and organisation are reviewed with the intention to establish a connection between design, design management and organisational change through *design management absorption processes*.

All the *Responses* (Chapters 4.1 - 4.4) end with summaries containing various syntheses in the form of frameworks. They build on each other to contribute to a *critical framework,* the *Design Management Absorption Model* (DMAM), which aims at explaining the *absorption of design* and *design management knowledge during design-driven innovation processes* in the context of SMEs with little or no prior experience. The DMAM also conceptualises *design management as a dynamic capability*.

This chapter closes with five research questions that will underpin the analysis of the single case studies and cross-case comparison in Chapter 6, Results and Chapter 7, Discussion.

4.1 Design and strategy

As seen in Chapter 2.4 design management amongst other things has been connected to leadership (e.g. Turner & Topalian, 2002). However, in regard to *corporate strategy* it is still common practice that designers are playing the role of "Cinderellas of strategy" catering to the needs of the decision makers of companies by providing them with "raw materials" for new business opportunities (Francis, 2002). This in spite of the fact that there was a broad discussion about design as a *strategic resource* and the strategic implications of using and integrating design into business[38].

In literature, two views on the relationship of design and strategy can be found: The first one relates design strategies to corporate strategy (Cooper & Press, 1995;

[38] For example Trueman and Jobber's (1998) *value*, *image*, *process* and *production* (VIPP) model attempted to contrast the marketing formula of the 4 Ps price, product, place and promotion. The authors proposed a comprehensive framework of how to compete through design attributes and to contribute to the strategic value of design[38] but did not achieve a similar impact on awareness as the 4 Ps.

Fitzsimmons, Kouvellis, & Mallick, 1991; Francis, 2002) or connects design and design management to concepts of strategic management such as Porter's value chain model (Stevens, Moultrie, & Crilly, 2008), or to the dynamic capability construct (Jevnaker, 1998). The second one argues that design methods and design thinking already include a strategic dimension and can support the process of strategy formulation and contribute to strategic thinking (Carlopio, 2009; Dew, 2007; Fraser, 2007; Golsby-Smith, 2008; Liedtka, 2000). This group can also be named the "strategy by design school".

In the first sub-chapter these two views are explored, in the second the relationship of design to the resource-based view or dynamic capability construct is analysed in more detail informing, at the end of this chapter, a *taxonomy* of four design management models, which distinguishes the strategic contribution of each model from the others.

4.1.1 Corporate strategy, strategy formulation and design

There are different schools of strategic management or ways to conceptualise strategy and the formulation of business strategies (Mintzberg et al., 2007; Mintzberg et al., 1996). While some see it as a planning process, during which markets are analysed to conceive of the next steps of a company (Porter, 1985), others describe strategy as "an underlying logic beneath the flow of decisions, which create the future" (Francis, 2002, p. 64). This means that strategy formulation can be seen as a rational process or as an intuitive and emerging activity. The late 80s and the 90s have been largely dominated by a more analytical stance to strategic management (Francis, 2002) and with it also the connection of design management to the planning school of strategic management (Mintzberg et al., 2007).

E.g. Fitzsimmons, Kouvellis and Mallick (1991) implicitly refer to one of Porter's three generic strategies, the one of differentiation, when they state that a design strategy is a strategy to achieve competitive advantage through product design. This can be done either through the design of new products and, thus, through creating new markets or through delivering products with better functions than the competition. Based on Garvin's definition of quality Fitzsimmons, Kouvellis, & Mallick (1991) name the following competitive dimensions, to which product design can contribute: *price, speed, flexibility, performance, feature, reliability, conformance, durability, serviceability, aesthetics* and *perceived quality*. Design management supports corporate strategists to use design as a "competitive weapon" (p. 398) through the management of design activities.

Also Cooper and Press (1995) define design strategies as the description of how a company uses design to achieve corporate goals as part of corporate strategy. However, Cooper and Press (1995) relate the design strategy to a wider set of design activities inside the company and to the marketing strategy. They posit, "a design strategy must work to

express that vision through the design of products, the corporate identity, corporate brochures, advertising, graphic symbols, and physical corporate environment itself (offices, buildings, etc.)" (pp. 228/229).

Other than Cooper and Press (1995), Stevens, Moultrie and Crilly (2008) make a distinction between *design strategy*, which "is the long-term plan for implementing design, a term generally used in product planning", and *strategic design*, which is "the use of design to become and remain competitive" (p. 51). In their literature review they come to the conclusion that design expertise can contribute in manifold ways to strategy:

- in conceiving and creating high-level products;
- in building product (or brand) differentiation and customer intimacy;
- as an integrator and mediator between professional domains, both within the organisation (e.g. marketing, production) and outside (e.g. suppliers, distributors, partners);
- as a hard-to-imitate tacit knowledge resource;
- in shaping, communicating and reinforcing an organisation's internal culture;
- in exploring uncertainty and assessing trade-off, through prototyping and visualisation;
- in stimulating creativity and providing fresh perspectives in the strategy context. (p. 56)

To sum it up, Steven, Moultrie and Crilly (2008) describe three ways how design can become strategic: 1. by 'high design' 2. by an integrated and coherent design approach to implement a strategic positioning, and 3. by using design methods such as visualisation, qualitative understanding of customers and stakeholders to inform strategy formulation. While the first two ways, again, relate design to Porter's generic strategies of differentiation, the value chain and five forces concepts[39], the last way builds on a debate that has been developing since around the year 2000.

This debate turns the tables on the attempt to free design from its subordinate role by relating design to well-known concepts of strategic management. On the contrary, Porter is being criticised because strategy formulation is not an analytical, technocratic, top down business process (Carlopio, 2009; Francis, 2002; Liedtka, 2000). Strategy formulation should be based on the "marriage of opposites" (Francis, 2002, p. 64) of the rationalist and the imaginative.

The above mentioned scholars introduce design thinking and abductive reasoning, design processes, or design as rhetoric as (new) tools to search for strategies and possible futures rather than "analysing a company's way into the future" (Golsby-

[39] Stevens, Moultrie and Crilly (2008) argue that with high quality becoming commoditised, design might be the last remaining competitive differentiator in a globalised market.

Smith, 2008). Referring to the Greek philosopher Aristotle and to Richard Buchanan[40], who has described design as the modern rhetoric, Golsby-Smith (2008) argues that foggy, confused situations start to crystallise through arguments, which in return will mobilise action. "Arguments are the engines by which humans create alternative futures" (Golsby-Smith, 2008, p. 49).

Liedtka (2000) suggests that design is a good metaphor for the strategy process because the design process has many connections to the one of strategy formulation. Points of departure for both of them often are "wicked problems", problems that are "open to multiple interpretations" (p. 13). Design offers a "Weltanschauung" (p. 13) that negotiates solutions rather than optimising them out of the problem. Designers also operate with "what if" hypotheses, shaping the process until "it talks back" to them. Liedtka (2000) finally stresses the point that abductive thinking uses the logic of conjectures rather than logic. Also Dew (2007) states that "abduction is about making inferences from information that is surprising or anomalous, which are both very typical in strategic decision making" (p. 38).

Fraser (2007) posits that there is an opportunity for both cultural transformation and strategic growth, when companies move from a concept of "economics of design" to the "design of economics" (p.67). Fraser (2007), both suggest a bottom up process of designing strategies by taking a deep understanding of customer needs as a point of departure, then developing concept visualisations and multiple prototypes on the new-found knowledge, and, finally, aligning these concepts with "future reality through strategic business design" (Fraser, 2007, p. 71).

To use design methods, however, or to approach the design of economics through abductive reasoning has to be built on a design capability or resource that already exists in a company. Design will have to have come out of its subordinate role in one company department and become a new (core) competence.

4.1.2 Company resources and design resources

The key concepts to understand design management as an organisational capability yielding competitive advantage and strategic flexibility can be traced back to Edith Penrose's "The theory of the growth of the firm" (1959) and to ensuing concepts of strategic management such as the resource-based view (RBV) or the dynamic capability construct (DC). These concepts have already been introduced in Chapter 2.1.2, 2.1.3 and 2.1.4 and 2.2. According to Penrose (1959) a company can be viewed as a bundle of productive *resources* with an "autonomous administrative planning unit" (p. 14) or management team deciding on how to deploy them to make a profit. These resources can

[40] Buchanan, R. (2001). Design and the New Rhetoric: Productive Arts in the Philosophy of Culture. *Philosophy and Rhetoric, 34*(3)

be physical such as plants or equipment, but they can also be intangible such as the human resources available to the firm.

Also design can be viewed as a bundle of resources. Based on Barney's (1991) definition, design can be regarded as a resource in several ways: Design is a process and can be viewed as an organisational "routine" (Nelson, 1982); design is a specific form of knowledge (Jonas, 2011); design can be an asset, e.g. in form of an in-house design team or a design alliance (Margaret Bruce & Jevnaker, 1998); and it is a set of design management capabilities ("intermediary goods") to enable the deployment of design resources (Gorb, 1990c) in a way to harvest the benefits "these services can render" (Penrose, 1959).

Borja de Mozota's (2006) defines four key characteristics of design resources or the "powers of design":

- Design is a differentiator (of products, services etc.).
- Design is an integrator (of different functions and team members).
- Design is a transformer.
- Design is "good business" through increased ROI, higher margins, revenues, market share etc., which describes the results of the use of design in a company.

Lately, the notion of design as knowledge instead of being a hands-on problem solving activity has become popular. Jonas (2009) re-conceptualises the notion of design in the following way: "Design is a *process,* which uses *knowledge* to generate new *forms* and new *(forms of) knowledge*" (p. 1). Design, thus, also made an entry in the broader notion of the knowledge society or the knowledge worker as described by Drucker (1994).

4.1.3 Organisational capabilities and design capabilities

Amit and Schoenmaker (1993) make a distinction between *resources* and *capabilities* that echoes the one mentioned above by Penrose's (1959): *Resources* are stocks of "available factors that are owned or controlled by the firm" (p. 35). *Capabilities* are the capacity to deploy them. As stated in Chapter 2.1.4 resources and capabilities are firm specific and have been developed over a longer period of time through learning processes. They are information-based, tangible and intangible processes and they "can abstractly be thought of as an 'intermediary goods' generated by the firm to provide enhances productivity of its resources, as well as strategic flexibility and protection for its final product or service" (p. 35).

A *capacity* is the ability to perform a certain task in a minimally acceptable manner (Helfat et al., 2007). To qualify as a capability the capacity to execute a specific task needs to have a *patterned element*, a company needs to be able to repeatedly perform a certain task or activity in a minimally acceptable manner.

In past design research design management scholars (Borja de Mozota, 2006; Margaret Bruce et al., 1999; Chiva & Alegre, 2009; Dumas & Whitfield, 1990; Kotler & Rath, 1984; Perks, Cooper, & Jones, 2005) investigated the use of design and identified different design and design management capabilities to deploy design effectively in companies of all sizes. Some of this research extracts specific design capabilities from product development processes (Perks, Cooper & Jones, 2005) or from the design management use of design-oriented companies (Borja de Mozota, 2006). Another distinction between competences or capabilities in the context of new product development can be done (Danneels, 2002) as follows:

- *Technology-related competences* (design and engineering know-how, product and process design equipment, manufacturing facilities and know-how, procedures of quality assurance)
- *Customer-related competencies* (knowledge of customer needs, preferences, and purchasing procedures, distribution and sales access to customers, customer good-will or franchise reflected in the reputation of the firm and its brands, communications channels for exchange and information between the firm and customers during development and commercialisation of the product)

However, in design management studies the terms competences, tasks, skills or capabilities are used ambiguously. They mostly describe a specific design management function or person executing tasks. Conversely, Jevnaker (1998) lists the following component capabilities of organisations managing design:

- Resourcing capability, the ability to acquire and manage profitable design resources
- Combinative capability, the ability to configure design resources
- Organisational learning capability, which is an absorption capability
- Innovation capability
- Design-strategic capability, capability to integrate design into business strategy
- Protecting capability of design-based advantages (p. 21)

This shift to viewing design management as an organisational capability (and not as a bundle of tasks) is a relatively new one.

4.1.4 Response 1: Design management as a dynamic capability

Design as strategy has come a long way from being the "Cinderella" (Francis, 2002) catering new ideas to top management to becoming a strategic resource to deploy at all company touch points to create a strategic positioning (Stevens et al., 2008), or to

repeatedly create "leading-edge products and communications by a qualified design approach" (Jevnaker, 1998), and thus dynamically stay ahead of the curve. On this journey from little to much significance *four design management models* in regard to their strategic contribution and direction can be distinguished.

A taxonomy (Table 4) of four design management models is proposed including:

- Silent design management
- Basic design management
- Integrated design management
- Dynamic design management.

Adapting Gorb and Dumas' (1989) notion of silent design, the first can be named *silent design management* or non-existing design management. Companies using or rather not using this kind of design management are not aware that they are making strategic decisions in, e.g. engineering design or marketing. Interestingly enough, design and design management has to accept that this process also "seems to work" (Gorb, 1990, p. 75).

The second model is called *basic design management*. These companies are interested in managing their processes more effectively and are mainly applying design (project) management to new product development. Representatives from theory of this (early) concept of design management are Farr (1965) or Topalian (1979). The latter made the point that British manufacturers would be able to escape the mediocrity of their products if design projects and new product development would be managed more effectively and efficiently.

The third model of *integrated design management* coordinates and deploys design in all departments, functions and processes to create a coherent customer experience and company positioning. Rachel Cooper et al. (2009) represent this viewpoint on design management by stating:

> Design Management is the on-going management – and leadership – of design organisations, design processes, and designed outcomes (which include products, services, communications, environments and interactions). (p. 50)

The fourth model, finally, is one of *dynamic design management* able to de-couple and re-couple or re-configure a company's design resources to match dynamically changing environmental needs. Danneels (2002) who researched the product development processes of five companies through the lens of the dynamic capability concept comes to the conclusion:

> My analysis of new products as interconnected through their reciprocal relationships with the firm's competences yields a view of firms as portfolios of competences, rather than of portfolio of products. (p. 23)

Dynamic design management is concerned with the development of design competences and capabilities rather than project management of design projects or designed outcomes. To develop innovations might include unlinking a specific competence from existing products and re-coupling it with new product ideas. By leveraging core competences a company has a fast and less risky way to grow and to renew itself. Product innovation is "an engine of renewal" (Bowen et al. 1994, cf. Danneels, 2002) and organisational renewal involves the building and expansion of organisational competences over time, often involving a change in the organisation's market domain. The following *taxonomy of design management models* (Table 4) compares the four models mentioned before using the categories of goals, mode/attitude, organisational processes, in which design is involved, design capabilities, people and contribution to corporate strategy.

Table 4: Taxonomy of design management models

DM-Models	Silent DM-Model	Basic DM-Model	Integrated DM-Model	Dynamic DM-Model
Goals		Effective and efficient (design) project management	Orchestration of all touch points through managing across functions	Sustainable competitive advantage through mediating between inner and outer worlds
Mode / attitude	Silent design	Selective design use	Systematic design integration	Transformation by design
Organisational processes	In marketing or engineering decision-making processes	New product development	New product/service development; corporate communication and design; brand management and design; customer experience management and design; design of environments, etc.	Strategic management; innovation management; process design; change management
Design capabilities	Unaware of design capabilities	Sourcing, briefing, designers; managing and evaluating design projects	Planning, coordinating, aligning, infusing	Designing the capabilities of the firm; de-/re-linking; (re-)configuring resources
People	Engineers, marketing/sales representatives, senior management	Designers, product managers, design managers	Design managers	Design leaders, senior managers, design managers
Contributions to corporate strategy	Arbitrary design	Differentiated products	Coherent customer experience and positioning	Strategic flexibility and competitive advantage

The Design Management Group of the Institute of Manufacturing[41] of the University of Cambridge puts design management models into a historical context: It attributes the silent design area to the post-war period, the superficial styling area to the 80s, the design led innovation area to the 90s, and views strategic design as a fairly recent development. While such a historical contextualisation is interesting, in SMEs all these levels coexist today depending on the awareness, need and organisational capabilities of a company.

Sun, Williams and Evans (2011) propose a new and different model of design management by putting design management into the context of the design industry and including activities and roles of design managers which are not only focused on intra-organisational processes and issues but also relate to the industrial context they operate in. The authors define design management "as the management of the various interfaces between design and other stakeholders in the industry" (p. 127). This framework could be viewed as a new model in its own right. It adds a missing dimension to all other design management frameworks that has been overlooked in theory but not necessarily in design management practice.

4.2 Design and organisation

In 2008, Richard Buchanan pointed out two conferences in the USA that were seminal for the "elevation of the idea that organisations are products" (p. 2) and that like any other product organisations can be designed: the Stern School of Business at New York University (2004) and the Weatherhead School of Management at Case Western University (2002) that collaborated with architect Frank Gehry on planning and constructing the new school building[42]. Since the 90s, designers and design consultancies started to compete with management consulting firms in the area of OD, and traditional consultancies started to use design methods as part of their OD practices (Buchanan, 2008).

Challenges as well as opportunities drove and still drive this development. One opportunity that has been identified by the design community addresses the growing disconnect between both the public and the private sector and the people these organisations serve (Burns, Cottam, Vanstone, & Winhall, 2006). For organisations of the like it is getting evident that a more human-centred approach would be helpful to improve the relationship with their customers. This could result in the realignment of the company's operations with *user needs* (Junginger, 2008).

Over the last years, the design community has also become more aware that designing is not only about things and products but about "integrated and dynamic

[41] http://www.ifm.eng.cam.ac.uk/dmg/resources/role_change.html (retrieved 19 Oct. 2011)
[42] See also Boland Jr., R. J., & Collopy, F. (2004). Managing as Designing. Stanford: Stanford University Press.

interactions with objects, spaces and services, and helping companies with more strategic decisions" (Fulton Suri, 2003, p. 39). So another important driver besides stronger emotional relationships with their customers is the need of companies for continuous innovation to stay ahead of the curve. Although a company "needs stability to function well", it also "needs change to survive" (Junginger, 2008). Innovation or new product development involves an inquiry into how things are. This can lead to organisational learning and capability building and the creation of new knowledge about customers and what matters to the company (Fulton Suri, 2003; Lojacono & Zaccai, 2004) and, finally, to organisational change.

Another important aspect of organisational development, learning and knowledge creation is the incorporation of *tacit knowledge* or the *conversion of tacit into explicit knowledge* to inform innovation processes and projects (Nonaka, 1994; Nonaka & von Krogh, 2009). Again design practice refers to tacit knowledge in different ways such as an emphasis on the *how* of doing things instead of the *what* (Walsh, Roy, Bruce, & Potter, 1992) or its ability to imagine, visualise and prototype the implicit and the hard to express (Rust, 2004).

This chapter intends to shed light on the relationship of *design and organisational change*, *learning and knowledge creation* and describes *design methods, tools and approaches* that are able to drive change and knowledge creation in organisations.

4.2.1 Design and organisational change

Organisational development usually aims at strengthening efficiency and productivity, at reducing overhead costs, or at assessing brain capital, which includes the successful access and utilisation of people's skills (Junginger, 2008). While in the past "traditional" organisational design has been dealing with e.g. financial reward systems for employees to enhance efficiency and productivity (Dunbar & Starbuck, 2006), some companies now acknowledge that design all together has a different take on change. For example understanding how to accommodate users expectations and how to provide a satisfactory customer experience can result in the improvement of internal processes and in organisational change (Junginger, 2008).

Different authors (Bates & Robert, 2007; Burns et al., 2006; Junginger, 2008, 2009) agree that design thinking and design methods, tools and approaches have the potential to contribute to change because of design's *propensity to start from user needs* when designing products as well as processes or organisational structures. Here, three positions of the above mentioned design scholars and practitioners are introduced that partly have different starting points for their concepts but overall talk about similar design characteristics to support OD.

Junginger (2008) states that organisations, which see new product development as a sequence of predetermined steps, are rigid and tend to view design as a "functional specialism" (Junginger, 2008, p. 29) with little decision power. On the other hand:

> An organisation that 'allows' product development to explore product opportunities by conducting its own research into the context of the product acknowledges product development as a valuable organisational activity in its own right. If properly understood and applied, product development can be a tool for managers who seek to transform their organisation. (p. 30)

Junginger (2008, 2009) describes an organisation as a human-centred product and the *new product development process* as a vehicle for change. Organisations that offer pathways of human experience into the company are designing from the outside in rather than from the inside out. Through a process of inquiry into the company's structures and processes, people, resources, etc. the organisation will learn about its customers, and about itself, and, finally, come up with a strategy for internal change.

Bate and Robert (2007) advocate a shift away from management oriented and commissioned forms of OD towards a more user-centred approach including other stakeholders such as employees and users rather than senior leaders in change processes. Based on Nathan Shedroff the authors develop and test an *experience-based design (EBD) intervention methodology* in a cancer clinic within the National Health Service (NHS). EBD is characterised by two core elements: a. a participatory element that includes users into the development of new products or services, not as authors but as "testimonies" that are able to provide "experience anecdotes" about their pathways through the health care system b. an experience element through thinking of services and products as providers of "moments of truth" or "touch points" that trigger either a good or a bad experience.

Like Junginger (2008), Bates and Robert (2007) elevate EBD to more than a design methodology or process:

> Traditionally, the aim of OD has been to change the organisation to make it more "healthy" and effective. However, within a design framework, the focus shifts from change to improvement, from process to outcomes. (p. 45)

Other than OD professionals designers aim at helping to design and implement better solutions and experiences for the users.

Burns, Cottam, Vanstone and Winhall (2006) even go so far as to advocate a new design discipline, *transformation design*, which is the result of developments in the practice of design over the last years. Interaction, experience and service design, they all broadened the scope of what design is about and brought about "a level of systems thinking, a focus on individual behaviour, and the orchestration of a range of different design inputs" (p. 10). On the other hand, design thinking has started to be applied outside of traditional areas of design: in communities, not for profit organisations, etc. In

Burns' et al. (2006) view design processes are especially well prepared to tackle problems from complex user needs by using a user-centred approach to problem solving, cross-disciplinarity and rapid and iterative prototyping.

Although the notion of transformation design clearly points to organisational development, Burns et al. (2007) do not think of it as a change management process but rather as a support to move towards a desired outcome.

4.2.2 Design and organisational knowledge creation

Fifteen years after Nonaka's first seminal publication on organisational knowledge creation theory, Nonaka and Von Krogh (2009) reviewed the debate up to that point and summarised the scope of the theory: to explain phenomena around organisational creativity, learning, innovation and change. They also repeated, of which three parts knowledge consists[43]:

- Firstly, of "justified true belief" (p. 636); people justify the truthfulness of their beliefs through their interactions with the world.
- Secondly, someone has knowledge because they perform certain tasks; this knowledge gained permits „to define, prepare, shape, and learn to solve a task or a problem" (p. 636).
- Knowledge is "explicit and tacit along a continuum" (p. 636), meaning there exist varying degrees of explicitness and implicitness of knowledge. The two forms are in a state of dynamic interaction with each other. (Nonaka & von Krogh, 2009)

Design can be seen as a form of knowledge in its own right with tacit dimensions (Jahnke, 2009) as well as explicit ones. Jonas (2011) describes designing as dealing with forms, processes and knowledge and states: "Design is a process which uses knowledge to generate new (forms of) knowledge (Jonas, 2011)." Jahnke (2009) states that design offers a "pre-modern practice-based knowledge and creativity" (p. 223) that has disappeared through the rational and scientific discourses of the engineering and management disciplines. He interprets the (new) interest in design thinking as the "resurrection" (p. 223) of pre-modern knowledge. Based on Lawson and Cross, Jahnke (2009) describes design as a form of knowledge that resides in objects, is immersed in material culture, is a creative, intuitive, reflective and largely embodied process, which uses visual thinking, metaphors and analogies.

Part of designing is rooted in knowing *how* to do things, rather than in knowing *what* things (Walsh et al., 1992), in prototyping, in experimenting, in intuiting, observing etc. While this quality is especially helpful during creative phases of new product

[43] The authors base their definitions of tacit and explicit knowledge on the works of Michael Polanyi between the late 1950s and 1960s. See also Chapter 2.2.5.

development, *visual imagination* can also be helpful as an enabler of knowledge creation in multidisciplinary brainstorming sessions or during strategy meetings.

Rust (2004) studied the contribution of design's use of tacit knowledge in the field of natural sciences. There is a "logical gap" between existing (scientific) knowledge and "significant discovery and innovation" (p.77). Designers have the ability to imagine new scenarios and to create experimental artefacts; their prototypes are able to unlock the tacit knowledge of designers and scientist alike who come into contact with these artefacts (Rust, 2004).

To make tacit knowledge accessible to an organisation it needs to be made explicit. *Knowledge conversion* can be defined as the interaction of tacit and explicit knowledge by justifying personal and subjective knowledge and bringing it together with others' knowledge, and the alternation of tacit and explicit knowledge to mutually enhance both (Nonaka, 1994; Nonaka & von Krogh, 2009). Jonas (2011) states that going from one form to new forms of knowledge it needs to have undergone a trans-disciplinary process of exchange and integration of different forms of knowledge from different stakeholders.

In order for visualisation, imagination, scenarios etc. to become prolific, some key characteristics of knowledge creation have to be considered (Nonaka, 1994):

- Organisational knowledge creation involves individual contributions as well as the discussion of these in teams and groups.
- New knowledge is born out of chaos or out of the *ambiguity* of many alternate meanings; ambiguity can lead to innovation.
- *Redundancy* is the process of making new meanings and metaphors available to everybody in the organisation and by doing so to work on a shared understanding of projects.
- *Metaphors* are able to guide the perception of different people into the same direction; metaphors offer images or symbols to diverse members of a team e.g. of product development; they make it possible to intuitively understand and share the common work.
- *Analogy* is an intermediate step between pure imagination and logical thinking.

To sum it up: Knowledge is different from data or information. It rather constitutes an interpretation of information (Belliveau, Griffin, & Somermeyer, 2004). "Knowledge is information combined with experience, context, and reflections that may be used to make decisions and take actions" (p. 94). This is very similar to what designers do.

4.2.3 Tools for organisational change and knowledge creation

Most likely any design approach, method or tool can trigger change if it is used in the context of an organisational inquiry. However, it would lead too far to enumerate all existing design approaches, methods and tools here. That is why in this thesis four different positions (Bevan, Robert, Bate, Maher, & Wells, 2007; Fulton Suri, 2003; Lojacono & Zaccai, 2004; Sanders, 2006) have been selected that make an explicit connection *to the impact on organisational development and learning* as well as on knowledge creation.

They also suggest categories that serve as a grid to structure the multitude of possible approaches, methods, and tools. Some of these categories are part of new product development and innovation processes, some pertain to the field of experience design and some others to strategy building and visioning. It is striking that all authors emphasise design research, the research of customer's latent needs and the situation that needs re-design as the most prominent thing. Without customer insight and a clear problem definition not only every development process becomes redundant but also the rational for the envisioned organisational future and the direction of change would be missing.

In her article, Fulton-Suri (2003) from IDEO asks questions such as: Which techniques and tools are helpful to research and represent the complexity of people's experiences? How can the presentation and discussion between designers, different professionals and business functions enable shared visions and the communication of experiential design ideas?

Lojacono and Zaccai (2004) state that in the business community design has become more and more the discipline to "denote the totality of activities and competencies that gather all relevant information and transform it into a new product or service" (p. 75). Intimate customer insight is necessary to readily react to environmental developments. While many companies already know about design methodology during new product development like brainstorming or prototyping, more needs to be learned in the area of design research (e.g. by including ethnographic techniques).

Elizabeth Sanders (2006) summarises different design research approaches that are part of the fuzzy front end of innovation projects: user-centred design, participatory design, critical design and empathic design. She especially regards participatory approaches from the Scandinavian countries as an alternative to a "US-centric mode of manufacturers pushing products at 'consumers' through marketing and advertising" (p. 4).

Finally, Bevan et al. (2007) describe how a team of practitioners, university researchers, and health care policy makers developed and applied design science thinking within the NHS. An innovation body of the NHS, the Modernisation Agency (MA) "stumbled on design" (p. 137), distilled and formulated a set of design principles to inform

future national improvements, and created and tried a breakthrough product based on a design process that could lead to large-scale change.

Table 5: Overview over different authors, categories and methods/tools/approaches

	Categories and methods/tools/approaches				
Fulton-Suri (2003)	*Categories*	Understanding what matters	Exploring design concepts	Communicating experiential ideas	
	Methods	Ethnographic methods; physical and cognitive task analysis; social network analysis; testing techniques from experimental psychology; participatory methods; looking at people in context; experiential methods	Sketching, modelling, proto-typing; story-boards, user scenarios, cartoon-like sketches, video; experiential methods such as acting with props, walk-through, dramatic improvisations	Storyboards, working demonstrations, video-dramatizations, screen-based simulations, experience prototypes	
Lojacono and Zacchai (2004)	*Categories*	Design research	Data analysis	Strategy building and implementation	
	Methods	Ethnographic techniques; bio-feedback, eye tracking, vocal analysis; brand personifications; testing prototypes in real life context	Issue mapping; metaphors; consumer archetypes; work-flow mapping; storytelling; bulletin boards	Using customer insights for market segmentation and innovation strategy; using design research finding to create organisation-wide identification and aspiration; using customer archetypes to coordinate functional areas	
Sanders (2006)	*Categories*	User-centred design	Participatory design	Critical design	Design and emotion
	Methods	Usability testing; human factors and ergonomics; contextual inquiry; lead-user innovation; applied ethnography	Generative tools; Scandinavian design	Probes	Empathic design
Bevan et al. (2007)	*Categories*	Reflection, analysis, diagnosis, description	Imagination and visualisation	Modelling, planning and prototyping	Action and implementation
	Methods	Intelligence, information gathering; sense-making; problem-definition; pattern seeking „A sense of here“	Picturing, goal-imaging; clarifying uses and impact on senses; designing a „sense of there“	Applying design patterns; identifying alternatives and multiple modelling	Doing; construc-tion/action; trialling, testing, and modifying

Table 5 gives an overview over the broader categories and the methods/tools put in order by authors.

4.2.4 Response 2: Design as a driver of organisational change

It can be said that design methods, tools and approaches shape new products, services, identities, brands and experiences. In addition, they support the change of an organisation, if designers and non-designers adopt the view of an organisation as a product, which can be designed. Lojacono and Zaccai (2004) state: "In fact, implementing a design inspired strategy tends to provoke some redesign of the company itself" (p. 79). Central to the notion of change by design is a human-centred or an experience-based design approach. Junginger (2009) sums up the following characteristics that facilitate the collaboration between a design team and an organisation:

- An early agreement on the principles of human-centred interaction design by all sides
- A consensus that the initial pilot project is conducted using design research methods to gain insights into people and the organisation itself
- A design problem that concerns a wide range of people
- An explicit understanding and use of an emerging process (p. 236).

By putting the user at the centre of new product development, innovation endeavours or strategy building the organisation not only learns about its actual and future target group but also creates new knowledge about its environment and about itself.

4.3 Design, innovation and innovation management

So far, design has been surprisingly absent from innovation studies because of a poor conceptualisation of design as a creative economic activity in companies (Hobday, Boddington, & Grantham, 2011). Furthermore, in innovation studies many disciplines such as management studies, economics, entrepreneurship, psychology or sociology converge into one broader notion of innovation with many concepts overlapping and little dialogue amongst them (Cruickshank, 2010).

Conversely, design, design management and design thinking thrive on situations, which are alive with opportunity and change. Recently, also companies, business scientists and business schools are more interested in the concepts and processes of design[44]. The recent rise in literature on design thinking and design-driven innovation (Brown, 2009; Rachel Cooper et al., 2009; Martin, 2009; Verganti, 2009) has been

[44] In Switzerland about 15 big companies from different trades joined a community of practice exchanging knowledge on a regular basis about design thinking and customer experience design.

sending self-confident signals to the business world; design practitioners and universities (the D-School in Stanford, Tim Brown), the media (Bruce Nussbaum), or scholars (Jahnke, 2009) advocated design thinking as an enabler of innovation.

Nonetheless, an array of different questions arises when it comes to the relationship of design and innovation: Is design-driven innovation distinct from other forms of innovation? How does it differ from e.g. technology-driven innovation? What are the contributions that design (management) makes to innovation management? And how exactly is it doing it?

In the 80s and 90s stage gate product development processes were propagated to enhance their effectiveness and efficiency (Cooper, 1990). Cooper (1990) had found that only one product in four would become a winner on the market, stage gate processes would help to reduce the cycle time of innovation projects and to improve the "hit rate" of new product development.

However, stage gate models are inherently sequential moving from one gate to the next, a fact that also triggered some criticism: Stage gate models support an attitude of "throwing things over the fence", that the work of one stage accomplished by one team would be handed over to the next without taking responsibility on how the development process would proceed (Bruce & Bessant, 2002). Design processes, on the other hand, are inherently *iterative, integrative, holistic,* and *cross functional*, thus, bring different qualities to new product and innovation processes.

This sub-chapter, firstly, deals with the *differences* and *complementarities* between technological and design innovation; secondly, it describes *design approaches* and *characteristics* in the context of innovation. Thirdly, it summarises the *(knowledge) sources* and *drivers* of design-driven innovation in an overview framework. And finally, it looks at design and *design management's contribution to innovation processes* and introduces a *design-driven innovation process model*[45] suitable for SMEs.

4.3.1 Differences and complementarities

Innovation is often equated with technological development, while many companies associate design with creativity; they also believe that only technology can change the framework of markets (Pannozzo, 2007). However, there has been research proving that a positive correlation between R&D-spending and successful market innovation cannot be made. Kyffin and Gardien (2009) point to the fact that, after inflated hopes concerning a new technology, there often comes a phase of disillusionment; the true potential of the new technology is being discovered later and sometimes even in a different field than expected (Kyffin & Gardien, 2009).

[45] Both frameworks have been developed in prior research (Acklin, 2010); they are connected to the topic of this thesis summarising essential elements of design-driven innovation management.

Pannozzo (2007) posits as well that many companies ignore the weak points of technological innovation: Scientists and engineers rarely think about the end-user experience, or often fail to understand that there are barriers to behavioural change for the future customer. Pannozzo (2007) sets design innovation apart from technology innovation underscoring the *distinctness* of the two. While technological innovation can be located at the crossroad of science and opportunity, design innovation is at the intersection of technology and opportunity. The sole criterion to define innovation, though, is *opportunity*.

However, while technological innovation leverages science to create new technologies and, after hitting the market, starts its journey towards commoditisation, design innovation will use existing technologies or technology enablers to create opportunities and meet unfulfilled customer needs (Pannozzo, 2007). Design innovations like Swiffer, the Walkman or the minivan did not invent new technologies, but "created new categories and market segments that in time attracted competitors and became targets for technology innovation" (p. 20).

The Commission of the European Communities describes design as *complementary* to other innovation models such as technological, employee-driven, price-driven or market-driven innovation (Commission of the European Communities, 2009). In the past, design has often been associated with form giving overlooking its contributions to user's needs, the environment, safety and accessibility considerations. "Design is a driver of and tool for user-centred and sustainable innovation and differentiation, complementary to R&D" (p. 7). Referring to the practice in Nordic countries of Finland, Denmark, or to the UK, user's needs and aspiration act as triggers or starting points for *participatory design activities* or *co-creation approaches*.

Utterback et al. (2006) describe "design-inspired innovation" – this the title of the book - as the *synthesis* of technology and *customers experience* that integrates the three different sources of innovation of *technology*, *needs* and (product) *language*. In the recent definition of design-driven innovation of the European Commission design's form-giving ability is implicitly considered inferior to a user-centred approach. For Utterback's et al. (2006), however, *language* such as the use of materials, shapes, forms, colours, surfaces etc. operates as a conveyer of socio-cultural *meaning* inscribed into the product, a view that is being shared by Steffen (2010) and Verganti (2009). Product language, especially its symbolic value encapsulates meanings.

During the early introduction stages of innovative technology, products often mimic established designs of less technically advanced precursors (Steffen, 2010). At later stages, *product semantics* are being used in various ways to visualise and communicate innovative product qualities. Steffen (2010) posits that product language is able to act as a source of innovation in its own right by interpreting socio-cultural trends and reacting to new social viewpoints.

A very obvious category of artefacts that almost entirely focus on the (unspoken) values of social groups are fashion items like e.g. jeans that not only used to be a piece of clothing but displayed a specific Weltanschauung by the ones wearing them. Also Verganti (2009)[46] describes design *as a creator of new meanings*. Innovative companies make radically new *propositions* to customers by pushing new meanings to the markets. In the best of cases technology push and design push of meanings intersect. While user-centred design will incrementally make a product better by including customer feedback, the proposition of new meanings is a different thing (Verganti, 2009).

4.3.2 Characteristics of design-driven innovation

As mentioned before, Jahnke's (2009) posits that in design practice "pre-modern practice-based knowledge and creativity" (p. 223) have survived in otherwise more rational and functionalist management styles and approaches to innovation. He regards the development in companies to integrate design thinking (holistic, user-centred approaches, etc.) into business and innovation practices as a resurrection of pre-modern knowledge within non-designerly firms such as engineering companies.

Jahnke (2009) makes a comparison of key characteristics between the field of innovation/engineering and the field of design (see Table 6). Although it is only meant to serve as a "rough guide" (p. 225) when designing implementation processes of design methods and tools into engineering organisations, it points to central differences in the approaches to innovation of the innovation/engineering and the design fields.

Table 6: Key characteristics of innovation/engineering and design (Jahnke, 2009)

Keywords	**Innovation / Engineering**	**Design**
Perspective	Product, Technology, Problem	User, Holistic, Solution, Novelty
Problem type	Defined, Quantitative properties	Wicked, Qualitative properties
Process	Analytical, Linear, Problem solving	Abductive, Explorative, Emergent
Knowledge tradition	Formal, Intellectual, Analytical	Practical, Embodied, Synthetic

Using the comparison of key characteristics of innovation/engineering and design as a starting point three characteristics of design, which are of special interest in regard to design-driven innovation, are now explored in more depth:

- Design is *explorative (and iterative)* and therefore more prone to deal with the uncertainties and paradoxes that come with innovation by going through iterations of solution finding.

[46] Verganti is one of the authors of the publication of Utterback et al. (2006).

- Design is *integrative (and cross-functional)* and therefore acts as an interface between different perspectives, variables, functions and stakeholders in the innovation context.
- Design is *holistic* and therefore is able to deal with the increased complexity of competitive markets and customer demand.

Explorative: Since Schumpeter's (1942) first definition of innovation, scholars recognized that there are paradoxes in innovation; e.g. innovation processes are not necessarily linear (Pavitt, 2005); strategies or ideas are emerging and not necessarily following a premeditated path (Mintzberg et al., 1996); new technologies might not always live up to the expectations (Kyffin & Gardien, 2009) making more search, more experimentation and more iterations necessary.

In this context one of design's most central contributions to innovation is something as "ephemeral" as an *explorative attitude*. "Organisations that want to embrace innovation therefore need to find ways of reconciling the tension that lies in the juxtaposition of creativity and implementation" (Von Stamm, 2008, p. 3). The rationale implicit in the notion of innovation, however, often focuses on the economic impact or the exploitation of new products, services, processes etc. on the market.

While the so-called *exploitation* phase of innovation is a necessary precondition for the successful implementation (March, 1991), a "decision-making attitude" of managers (Boland & Collopy, 2004) that prematurely interferes with the phase of finding new solutions, can stifle innovation processes. *Exploration*, on the other hand, comprises search, variation, risk-taking, experimentation, play, flexibility, discovery and innovation (March, 1991).

Many of the keywords mentioned by March (1991) would easily make up a list of approaches used by designers in design processes (compare to Brown, 2008). There is also plenty of academic (Cross, 1997; Lawson, 2004) and anecdotal evidence that designers will use a defined process to develop innovative and creative solutions but still won't exactly know where the journey is going like this quote from a blog (Hilgenstock, 2008) exemplifies:

> If you meet a manager in an elevator and ask him where he is in a certain project, you should be able to expect a more or less precise answer. – If you address the same question to a designer the answer will probably be: 'NO IDEA. – ASK ME AGAIN WHEN I'M DONE.[47]

Von Stamm (2008) introduces the concept of the tortoise mind and the hare brain of Guy Claxton who distinguishes between two "modi operandi", two ways how people can respond to a given situation. While the hare brain mode is a conscious, deliberate and purposeful way of thinking, the tortoise mind will let things sink it, will rather try to understand the situation properly than to jump to conclusions too early. While the hare

[47] http://www.sachlichkeit.org/blog/?p=61 (retrieved 3 March 2011)

brain mode is appropriate to quickly solve a clear-cut problem, the other will be more helpful, when problems are ill structured and complex (von Stamm, 2008). [48]

Design is consciously seeking out leeway to stay in a fluid state of development as long as possible (Gehry, 2004) or in an iterative state of searching for the best solution (Boland Jr. & Collopy, 2004). Design, one could say, embraces the uncertainty that innovation processes bring with them.

Integrative and cross-functional: The D-Shool in Stanford[49] advocates a framework that overlaps the three broader fields of business, technology, and human factors pointing to the fact that design-driven innovation will be a combination or an integration of these three fields. It also implies that different stakeholders and professionals from these fields will have to cooperate to achieve design innovation or solve complex problems. Thus, design-driven innovation involves multi- or cross-functional teamwork.

Being at the interface between different disciplines, perspectives on and variables of a situation can confront design with so-called "wicked problems", a term coined by Horst W. J. Rittel (Rittel & Webber, 1973). As summarised by Rith and Dubberly (2006), Rittel introduced the idea that simple problems are easy to solve. In simple problems stakeholders such as experts or designers agree on the definition of the problem; defining the problem inherently already defines its solution.

If stakeholders are not able to agree on a problem definition or not even define it clearly things get "wicked" but the solutions might have the potential to turn into innovations. To become an innovation, a "wicked problem" instead calls for re-framing[50]. For this purpose, many people will have to be involved discussing and arguing about the different variables of the problem and agreeing on goals and actions to solve them (Rith & Dubberly, 2006). Rith and Dubberly (2006) state:

> Science is concerned with factual knowledge (what-is); design is concerned with instrumental knowledge (how what-is relates to what-ought-to-be), how actions can meet goals. The process of argumentation is the key and perhaps the only method of taming wicked problems. This process is political. Design is political. (p. 2)

Bezerra (2010) maintains that design is becoming more and more a method to navigate or to dive into *complexity*. For design, however, there cannot exist a perfect equilibrium, only change in the face of complexity. Design operates as an *interface* between such diverse fields as the arts and humanities or technology and science (Bezerra, 2010). At the DMI conference 2010 in London, Bezerra introduced a framework (Figure 8, overleaf) with design standing at the crossroads of a horizontal and a vertical axis between the poles of subjectivity and objectivity and analysis and synthesis, and the above-mentioned disciplines.

[48] See also the creative problem solving process of Lumsdaile and Lumsdaile (1994)
[49] http://dschool.stanford.edu/big_picture/multidisciplinary_approach_detail.php (accessed 3 March 2010)
[50] See also Watzlawick, Weakland and Fish's (1974) mentioned in Chapter 2.2.4 on organisational development.

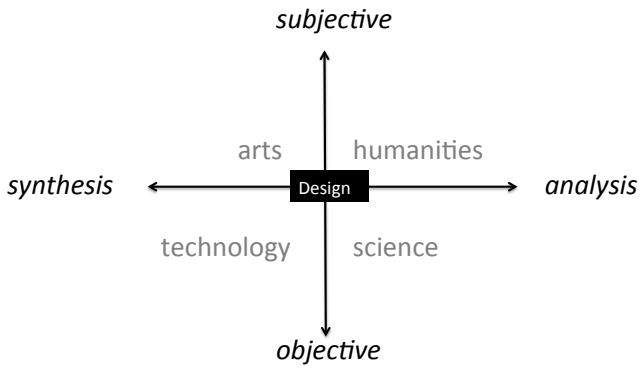

Figure 8: Design as an interface (Bezerra, 2010)

Design is not only mediating between the single user and his personal need (*the subjective*), but also between the total numbers of user needs. They have to be integrated into design products and services that accommodate a whole target group (*the objective*), oscillating between *analysing* complex systems and finding new solutions (*synthesis*) to navigate complexity. Design acts as a mediator between these opposites dealing with the reconciliation of multiple, complex and sometimes even contradictory demands.

Design can also be defined as an *interface* between *form* and *context*. Jonas et al. (2009) describe design as an activity in the "interface region between form and context, which aims at the creation of the fit between them" (p. 230). With context the psychic, social, cultural, economic, ecological environment is meant. The aim of human-centred design is to integrate the context and optimise the interface, which can be a difficult task, since forms might quickly loose their validity because the meanings ascribed to them change in society (Jonas, Chow, & Schaeffer, 2009).

Holistic: In design there exist three levels of complexity: products, uni-systems and multi-systems (Doblin, 1987). Products are tangible or comprehensible objects ranging from, e.g. a table to a brochure or sign. Uni-systems are sets of products including people who operate them. Doblin (1987) makes the example of an airplane or a kitchen, the latter comprising household appliances besides furniture. This definition might also include services that are being offered along with the products.

"Multi-systems are comprised of sets of competing uni-systems" (p. 4); this last definition includes the market dimension and its competitors, widening the notion of complexity even more. To gain competitive advantage the providers of uni-systems have a need to differentiate their offerings. While a technology focus might add product qualities like higher performance or more features at a lower cost, design will work towards a holistic *customer experience,* which is more than the product itself. It includes packaging*, services*, etc. (Utterback et al., 2006).

In the last approximately ten years, *customer experience management*, *experience-based design* (Bates & Robert, 2007), or *service design* (Mager, 2007; Saco & Goncalves, 2008) have become more and more important for the business as well as for the design practice and can be considered drivers as well as outcomes of design-driven innovation There is a certain overlap with other notions developing in the US (human-centred design) or in the Nordic countries (participatory design). While UCD[51] originally is task-oriented, in experience-based and service design the intangible quality, the look and feel evoked by products, services or encounters at any touch points have moved centre-stage. Services and experiences are being staged, choreographed, visualised etc. (Mager, 2007) to meet the physical, sensual, cognitive, emotional, kinetic, and aesthetic aspects of experiences (Bate & Robert, 2007). Thus, these newer design disciplines necessitate an ever more holistic frame of mind and approach than "traditional" ones.

While using a holistic approach to problem solving might at first sight make things (appear) more complex, there are also advantages that can be derived from it. By using system's thinking design is able to support *modular* forms of production processes, product portfolios and product architectures (Utterback et al., 2006). Through working on a system's instead of a component's level design is able to develop product architectures, which are manufactured of few components, but nevertheless enable mass customisation production processes (Utterback et al., 2006).

4.3.3 Drivers of design-driven innovation

Utterback et al. (2006) posit that design-driven innovation "requires a creativity of higher order" (p. 1) to achieve the synthesis of all the many variables of innovation projects. It is the task of design-driven innovation management to connect the areas of *technology*, *needs* and *language* through an *explorative (iterative), integrative (cross-functional), and holistic innovation journey*. Design-driven innovation can be seen as an amplifier of product and service qualities that evolve into *systems* of products, services and experiences depending on the scope of the innovation project.

Besides integrating professionals from the main innovation sources of technology, needs and language in cross-functional teamwork, this journey might as well include multi-professional collaboration between different design disciplines from such diverse fields as interaction, industrial, service or experience design.

[51] Gould and Lewis (1985) sketched out three principles that have been imperative for the design practice of user-centred design and became an international standard, the ISO 13407s: 1) early focus on understanding the user and the tasks he or she has to achieve; 2) user tests through prototypes or simulations during the development process; 3) iterative design through measurement, re-design, measurement etc. (Gould & Lewis, 1985)

Based on Utterback's et al. (2006) this chapter ends with an extended version of the original *technology*, *needs*[52] and *language* model (Figure 9). *Drivers* that might become the starting point of innovation projects have been added as well as the *characteristics and qualities* design brings to the innovation process.

Figure 9: Drivers and sources of design driven innovation (based on Utterback et al., 2006)

4.3.4 Design management and innovation management

In the innovation model displayed in Figure 10, which is exemplary for many similar models, the innovation process is described as a funnel, through which ideas enter the R&D activities of a company. Many of these models including the stage gate model (Cooper & Kleinschmidt, 1990; Cooper, 1996) in Chapter 2.3.2 do not mention the use of design explicitly.

Industrial design can be part of the R&D activities of a company and included in the conception phase. Often it is being "inserted" at the very end of the development process, though. So the full potential of the design methodology such as design research during the fuzzy front end of the innovation process or design management in the later

[52] The notion of need is a complex one and can be categorised into drivers that improve the overall quality of products, interfaces, services etc. and, thus, the quality of life of users, drivers that contribute to higher goods such as the habitability of the planet, drivers that bring forth delightful or meaningful experiences, or drivers that support involvement and self-actualisation of users.

phase of commercialisation is not tapped. Ulrich and Eppinger (1995) included design into the product development process but without mentioning the contribution of design and design management to the so-called fuzzy front end or the final product launch either.

Funnel models such as the one below depict the innovation process as a bottleneck from where the strongest projects emerge. According to Nichols (2007) the philosophy behind funnel models is more about killing off as many ideas as possible than using them creatively. The model also leaves open how the funnel is being "filled". Ideas quasi fall out of the sky and find their way into the funnel. However, the so-called fuzzy

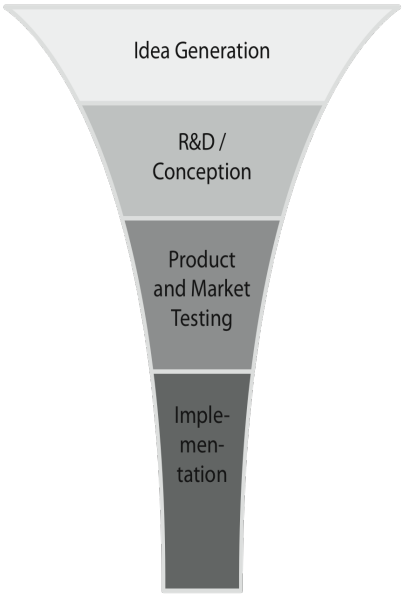

Figure 10: Innovation funnel according to Benkenstein (1998)

front end is crucial for the later direction and result of an innovation project (Lojacono & Zaccai, 2004). First ideas need to be of quality or else "crap" will come out of the funnel (Nichols, 2007). During this first stage, the systematic and pro-active build-up of customer insights is neglected and – as a consequence – first ideas will not be connected to existing or latent customer needs. Nichols (2007) also points to the problem of the 'not invented here syndrome', if only internal technology and knowledge will get chosen for innovation projects.

Many SMEs are risk-averse because they have few financial fallback positions (Cox, 2005). So for SMEs the funnel model poses further problems: Often ideas are coming from R&D, marketing and sales, or senior management (Rüggeberg & Burmeister, 2008). However, for SMEs to "digest" a large amount of ideas and select the most promising for further development is difficult without having the necessary decision making criteria from initial market or user research. Funnel or stage gate processes make the "right" choice and the assessment of ideas longer and more expensive (Nichols, 2007).

Another hurdle is the alignment of all processes inside the company for the launch of the new product or service. As mentioned before, new product development at later stages can make the alignment of product, brand and communication necessary. However, few SMEs do have an awareness of design management and the necessary capabilities to create a coherent customer experience for the launch of the new product or service.

Design scholars such as Junginger (2008) or Buchanan (2004) promote a different, a user-centred approach to innovation management. Buchanan (2004) proposes the process of interaction design as a means to create "intellectual integrity" as well as "emotional and aesthetic satisfaction" (p. 56) in products and services. The *design process* with its phases and characteristics can be viewed as a core element or even as a tool to implement design-driven innovation and design thinking in companies. The phases and activities of the (interaction) design process in an organisational innovation or product development context go from vision, to strategic planning, to implementation (Buchanan, 2004). This illustrates that design connects different corporate levels, functions and processes such as company vision (strategic management, brand management), product planning and marketing, and distribution through the new product development or innovation process. Some scholars would also consider part of the above mentioned process steps as typical design management tasks.

Figure 11 is placing the above-mentioned contributions of *design, design research, design leadership* and *design management* and its deliverables into a framework that connects

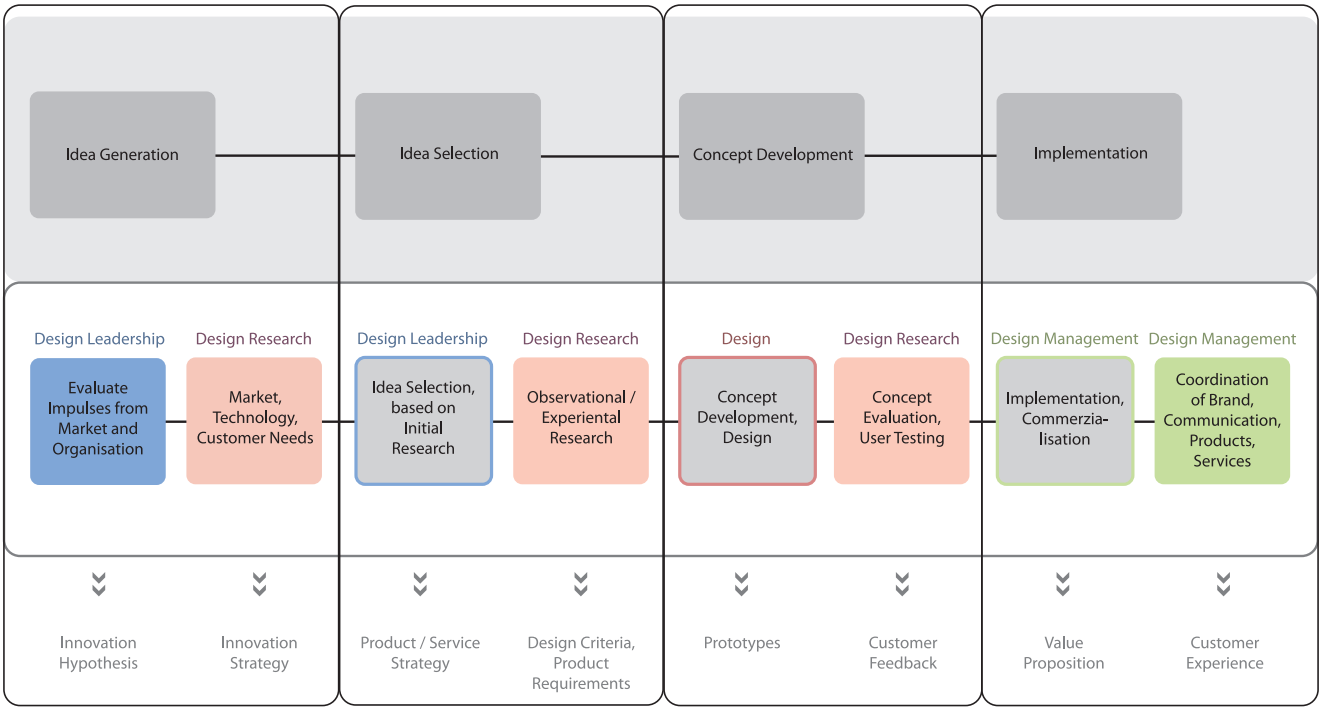

Figure 11: Design and design management capabilities and outcomes in the innovation process

them to the phases of a generic innovation management model (Acklin, 2010).

During the early stages of idea generation and selection the main contributors are *design leadership* and *design research* (Figure 11). Design-driven innovation management and the alignment of projects to the vision, identity and brand of a company (Buchanan, 2004; Turner & Topalian, 2002) are central tasks of *design leadership*. Design leadership also establishes the necessary structures and processes inside a company, through which organisational learning and the observation of emerging market trends form the foundation for a future innovation strategy.

A starting point of innovation projects can be the creative reframing of the problem the project sets out to solve; by reframing the problem and formulating a first hypothesis new approaches and solutions beyond incremental changes become more feasible. The process of idea selection is accelerated as well. First hypotheses will have to be researched in more depth in a triangulation of market-, user- and technological research.

As mentioned in Chapter 4.2.3 *design research* provides insights into (latent) customer needs through the use of ethnographic research or the research of contexts, in which product and services are being used (Lojacono & Zaccai, 2004). During concept development, further research phases can deepen the understanding of customer behaviour or the use of the new product or service through user testing etc.

Finally, design management is an activity that is helpful for the implementation of innovation projects inside the company, connecting management functions and processes, connecting philosophy, strategy and delivery. Design management will also, by operating as a coordinator, take responsibility for a coherent customer experience for the new product or service at all customer touch points.

4.3.5 Response 3: Design-driven innovation process for SMEs

Taking the above-mentioned contributions of design and design management into account, a *design driven innovation process model* for small and medium sized companies is included in this thesis that was developed in prior research (Acklin, 2010). For SMEs with less standardised processes, this model proposes to intertwine strategy building, innovation management and design management into one process with six stages defined in our design-driven innovation management model (Figure 12), which are *impulse*, *research*, *development*, *strategy*, *implementation* and *evolution*.

These stages do not necessarily need to be executed in a linear succession but can be worked on in parallel as well. However, the starting point of a design-driven innovation process is an *outside-in perspective* as described by Junginger (2008) or Fulton Suri (2003), the inquiry into (latent) user needs. The *impulse* stage comprises a mix of market and user observation, and analysis. According to Utterback et al. (2006),

innovation is the result of generating and integrating knowledge. Often, a trigger from the environment kick-starts and drives the process of knowledge generation. The impulse can also be a pro-active act by defining a "hunting ground" (Laboranova, 2009). This stage aims at describing what kind of market and customer trends have been emerging and at formulating a first hypothesis.

In the *research* phase appropriate methods that can include ethnographic, trend, experiential research but also technological and market research are applied to understand the question in more depth (Fulton Suri, 2003; Lojacono & Zaccai, 2004). The *development* stage then should be informed by criteria deducted from the analysis of the research material.

In this model, the *strategy* phase follows the impulse, research and development stages; it entails the formulation of a value proposition of the new product or service. The more radical the new offering, the more change of strategy (and ultimately organisation and culture) can be triggered by new product development (Junginger, 2008). Another logic behind the change of sequence is that the inquiry into the market gets to be centre stage not self-made ideas[53]. By switching around the sequence of stages, business strategy development is enriched by data on trends, customer needs, emerging technological trends etc., and by stakeholder involvement such as suppliers to improve market power.

In the *implementation* phase appropriate adjustments of operations and measures for the launch such as an adapted brand and communication strategy etc. can be made involving - as mentioned above - design management as a coordinator and enabler of an overall customer experience connected to the new offering. The last stage, with a strong emphasis on stakeholder involvement and customer feedback, is the *evolution* phase to improve the innovative product or service.

This design-driven innovation management model has the following characteristics: it is *integrative, holistic*, and *cross-functional* as described in Chapter 4.3.3. An addition to these characteristics is the *permeability* of the process. Each stage includes a more inner-oriented as well as an outer-oriented activity. This does not mean that a SME should completely dispose of its boundaries and its distinctness from others. However, R&D or innovation activities of a firm can be combined with methods of open innovation by inviting consumers and lead user to co-create new offerings (Chesbrough, 2003). By using frequent feedback loops with customers, suppliers and other stakeholders throughout the development process, the SMEs are also more likely to reduce the risk of market failure of a new product and service.

[53] A central insight form a study in Central Switzerland is that most SMEs use internal ideas as a starting point for innovation, if they innovate at all (Wolf, Schweikert, Küchler, & Stössel, 2005)

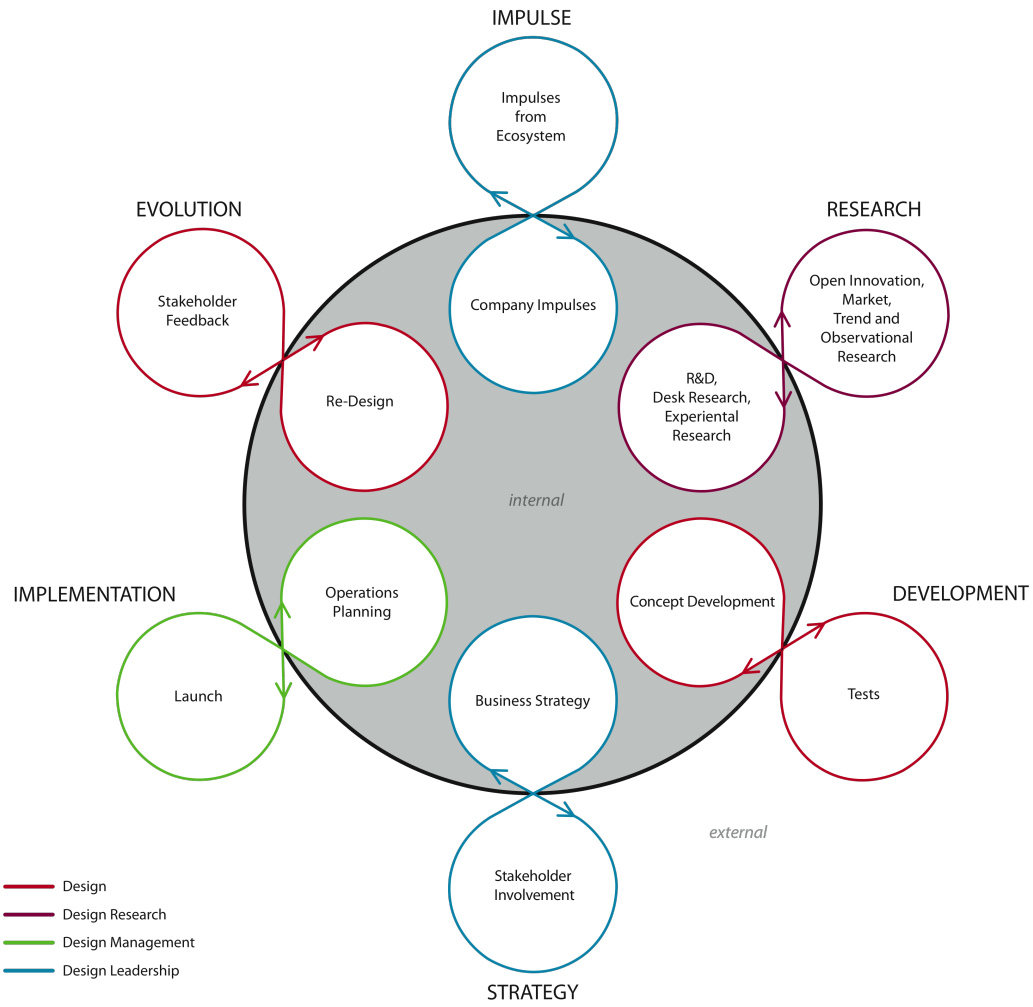

Figure 12: Design-driven Innovation Process Model

4.4 Design management and absorptive capacity

To continuously absorb knowledge from the environment and from stakeholders is an activity and capacity inherent to innovation. This is why this chapter explores the implications of the *absorptive capacity construct* (Cohen & Levinthal, 1990; Zahra & George, 2002) from the innovation studies for the *design management studies* and for knowledge absorption and capability building in SMEs with little or no prior design experience.

The absorptive capacity construct represents an excellent foundation to describe and analyse the adoption and integration of new design and design management knowledge by SMEs with little or no prior design experience. Response 4, thus, proposes a *Design Management Absorption Model* to evaluate the empirical data gathered during the

action research project, and formulates three hypotheses attached to the model. The absorptive capacity construct is adapted to include *design management* and *design leadership capabilities*, and *indicators* underpinning the absorption process to measure the progression of new design management knowledge.

4.4.1 Absorption of design and design management

Unlike marketing, which emerged at around the same time (Gorb, 1990a) design management failed to be widely adopted as a management function (Sun, Williams, & Evans, 2011). Only lately, the debate on design thinking and the ensuing inclination of renowned companies such as Procter & Gamble (Martin, 2009) to include design knowledge into their value-creating and innovation processes has sensitised more organisations to the value of design. Although the notion of design thinking is ambiguous and has provoked mixed reactions in the community of design practitioners as well as design scholars (Hassi & Laakso, 2011) the "hype" has mostly been restricted to larger organisations.

Many SMEs are still unaware of design as a strategic resource; some because they are technology-driven and are making "silent design" decisions (Gorb & Dumas, 1987) or doing engineering design (Blaich & Blaich, 1993); some because barriers such as limited human and financial resources, less formal or nonexistent product development and innovation processes (Fueglistaller, 2004), lack of access to design resources (Cox, 2005), or poor design understanding (Moultrie et al., 2007a) make it difficult to integrate a design management function.

With national design programmes, design councils or other knowledge brokers such as universities, a shift towards engaging with SMEs can be observed because they represent most organisations in Europe by number[54]. Regional design centres have been facilitating matchmaking between designers and SMEs or launching design support programmes. There has been a move towards more substantial knowledge transfer including the business and leadership role of design and the promotion of innovative tools as well as design management methods (Boult, 2006).

Still, there are many reasons for the gap between design and management. To acquire and to manage new design knowledge can be difficult (Bruce & Jevnaker, 1998) – for large firms as well as for SMEs. Because:

- Design knowledge has rarely been part of management education and, thus, is an unknown resource to many managers (Boland Jr. & Collopy, 2004; Jevnaker, 1998; Martin, 2009) as well as to engineers (Jahnke, 2009).

[54] http://ec.europa.eu/enterprise/policies/innovation/policy/design-creativity/edii_en.htm (retrieved 23 Sept. 2012)

- Design is an "experience good" (Commission of the European Communities, 2009). Confidence in design as a resource grows, once there has been positive experience with and observable effects of the use of design (Perks et al., 2005). Furthermore, design knowledge is personalised (in form of individual design expertise) and heterogeneous (Jevnaker, 1998).
- A "design attitude" (Boland & Collopy, 2004) has some irritating "ingredients" for management teams such as an insistence on fluid and iterative processes of searching, experimenting and prototyping, zooming in and out of the problem while maintaining a holistic view (Conley, 2004), accepting high levels of uncertainty (Jevnaker, 1998), while evaluating multiple alternatives (Conley, 2004), and being led by a human-centred design ethos stressing empathy with user needs as a starting point for innovation (Brown, 2008). Also the tacit dimension of design knowledge that is embodied in products as well as in people has been mentioned (Jevnaker, 1998).

From these few observations it can be concluded that starting to use design as a strategic resource involves a learning process on the side of SMEs on how to tackle and to manage this new knowledge or strategic resource. While, as stated before, much of the design management literature has focused on definitions, goals, responsibilities and tasks, little attention has been given to the question of how companies with little or no prior design experience build the capabilities to execute design management. A task-based or functional perspective of design management describes how design management operates in a company on a day-to-day basis. A focus on capabilities and how they are built, however, uses a perspective of organisational learning and the configuration of resources.

To sum up the key concepts mentioned in Chapter 2.3.5 again: The capacity of companies to absorb new external knowledge is critical to innovation. Absorptive capacity (ACAP) is "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990, p. 128).

Referring to the resource-based view (Barney, 1991) and to the dynamic capability concept (Helfat et al., 2007; Teece et al., 1997), Zahra and George (2002) re-conceptualise ACAP as a set of organisational routines and processes. They describe ACAP as a dynamic capability that impacts on the resource base of a company providing a company with multiple sources of competitive advantage. They suggest that there are four organisational capabilities: knowledge acquisition, assimilation, transformation, and exploitation.

Drawing on insights from cognitive behavioural science, Cohen and Levinthal (1989, 1990) state that prior knowledge helps to value new information and to assimilate

it. Zahra and George (2002) build on this insight from cognitive behavioural science by distinguishing potential capacity (PACAP), the ability to acquire and assimilate knowledge, from realised capacity (RACAP), the ability to transform and exploit new knowledge. While PACAP makes a company susceptible to learning, RACAP enables the company to leverage PACAP.

However, contrary to Cohen and Levinthal (1990) that stressed the importance of prior knowledge in the absorption of new knowledge, Zahra and George (2002) propose that knowledge needs to be *related* and at the same time *different* from prior knowledge.

It's a common experience of design practitioners and of previous applied research of the author of this thesis (Acklin, 2010, 2011b; Acklin & Hugentobler, 2008) that SMEs will often reject or abandon the idea of integrating design into their innovation and new product development projects early on. This is explained by time or money constraints by the SMEs but often points to a deeper chasm between engineering and design or management and design values and their ways of "handling things". This points to the question, whether design knowledge is more difficult to absorb than other forms of knowledge.

An empirical study with French companies from the clothing and the construction business investigated the difference of design knowledge from engineering or marketing knowledge during the absorption process in new product development and came up with an enlightening list of typical attributes (Abecassis-Moedas & Mahmoud-Jouini, 2008): 1. Companies perceived design as related to an individual designer/architect rather than embedded to a collective as in their firms. 2. Design relies strongly on tacit rather than explicit knowledge, the latter being more present in e.g. manufacturer or retailer's knowledge. 3. Designers are inclined to use divergent thinking rather than convergent. Designers rather strive on creative exploration, while e.g. engineers work on well-specified problems. 4. Designers keep to a peer-orientation giving more importance to their peer's opinions than to the one's commissioning the project.

Abecassis-Moedas and Mahmoud-Jouini (2008) come to the conclusion that positive effects for the firm can be observed on NPD performance such as process efficiency (cost) and product effectiveness (quality) if the source knowledge as represented "through the archetypical figure of the architect or the fashion designer" (p. 474) is at the same time related and diverse and if it is combined effectively with the recipient's knowledge (firm). On the recipient side, however, an organisation's absorptive capacity is not the achievement of any single individual inside a company, but depends on the links across individual capabilities. An organisation must New actively socialise new knowledge to be exploited (Zahra & George, 2002).

4.4.2 Response 4: Critical framework and research questions

Based on innovation and design management studies, the Design Management Absorption Model (DMAM) conceptualises design management as an organisational capability that facilitates the absorption of new design resources and leverages design knowledge to achieve competitive advantage. Figure 13 (overleaf) summarises all elements of the DMAM, and their relationships to each other. This model will be used to evaluate company case studies in the empirical part of this thesis.

The absorption process and design management capability building can be supported by the use of *design approaches* and *tools* as well as by (sustained) collaboration with external designers. If the absorption of new design knowledge moves from potential to realised absorptive capacity through socialisation and diffusion of design knowledge inside the company, design management can yield external outcomes as well as internal effects such as strategic flexibility and, ultimately, act as a dynamic capability (Figure 13).

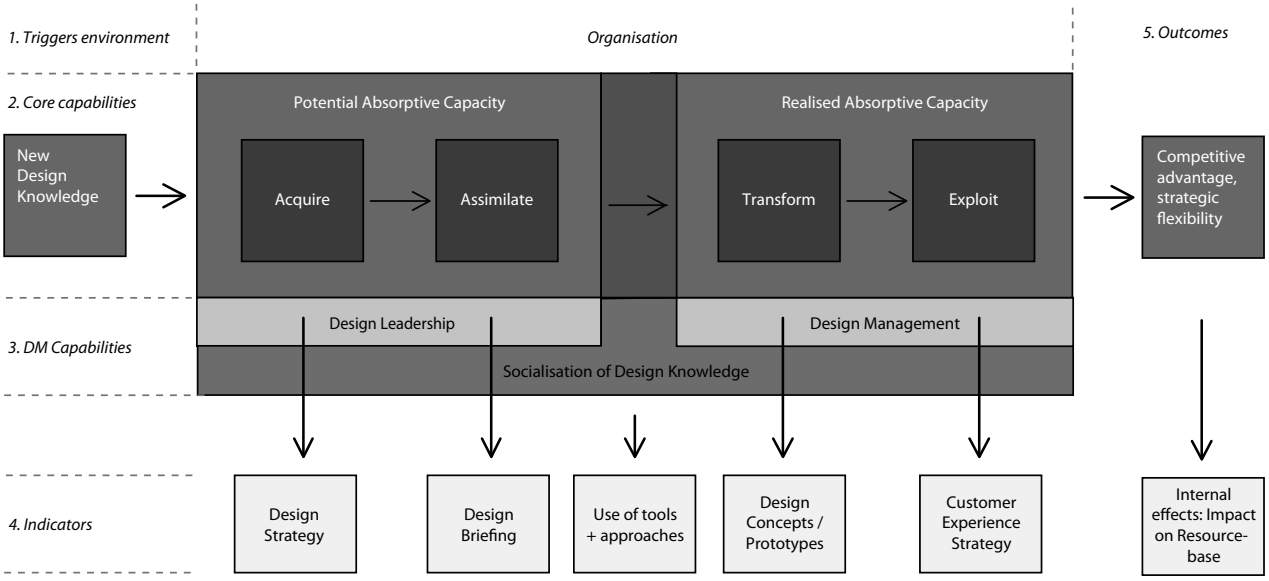

Figure 13: Design Management Absorption Model (extending Zahra & George, 2002)

Triggers

One of the central questions is, how new design knowledge finds its way into the company. According to Zahra and George (2002), internal or external triggers such as an organisational crisis, a performance failure, technological shifts, or radical innovations that occur outside the company activate the absorption of new knowledge. It has also been mentioned that the firm's motivation is key to the willingness to absorb new knowledge (Abecassis-Moedas & Mahmoud-Jouini, 2008).

Core capabilities of design knowledge absorption

Following Zahra and George (2002), design management absorption is divided into the four organisational capabilities of *acquiring*, *assimilating* (PACAP), and *transforming* and *exploiting* (RACAP) new design knowledge. While these steps might be similar for all absorption processes independent of the nature of the new knowledge its only through detailing them for design management purposes that they become relevant for design scholars and practitioners.

- *Acquisition* consists of recognising the value of design and identifying a specific design contribution to the company's bottom line. Initial activities of this step entail *learning* about design's added value, *assembling* different sources of knowledge, *focusing* them, *analysing* the current use of design in the company and understanding where design fits in.
- *Assimilation* entails a deeper commitment to the new design knowledge by *connecting* it to engineering or marketing processes and projects and by establishing to work with either complementary sources of design knowledge. Activities comprise the development of appropriate structures, processes and teams, *sourcing* external design knowledge, etc.
- During *transformation*, the new design knowledge has to be deployed effectively to improve offerings such as products, brands, services, communication, experiences, or efficiently to manufacturing or innovation processes. *Design key projects* are developed such as first concepts, prototypes or even first internal best practice.
- *Exploitation*, involves the company-wide implementation of new design knowledge through integrating them into relevant processes, coordinating functions, aligning core values, training staff etc. and through delivering a coherent customer experience at all touch points.

Since absorption processes mainly take place during concrete work assignments and projects, the DMAM follows a prototypical development process here.

Design Leadership and Design Management Capabilities

In this thesis a distinction between design leadership and operational design management capabilities is made (Borja de Mozota, 2003b; Cooper & Press, 1995; Topalian, 1979; Turner & Topalian, 2002). This distinction is useful to connect the DMAM to SMEs, which are strongly controlled by the owner/founder of the company (Fueglistaller, 2004; Mintzberg, 1979). He or she is the "gatekeeper" as described by Cohen and Levinthal (1990) and determines whether design knowledge classifies as useful or not. In the DMAM, *acquisition* and *assimilation* are related to design leadership capabilities and *transformation* and *exploitation* to design management capabilities, although the notions blur into each other (Turner & Topalian, 2002); because owners of SMEs are involved in strategic as well as in operational work (Fueglistaller, 2004). The DMAM refers to design management capabilities as described by different authors (Jevnaker, 1998; Perks et al.,

Table 7: Design leadership and management capabilities connected to design management absorption capabilities

Acquire	Assimilate	Transform	Exploit
Design Leadership capabilities		Design management capabilities	
Defining hypothesis for new business opportunity; formulating a design strategy as part of company strategy (Jevnaker, 1998).	Sourcing design expertise and combining it with in-house team expertise (Jevnaker, 1998); briefing of external partner (Perks, Cooper, & Jones, 2005); contracting and allocating resources.	Facilitating project development (Topalian, 1979); managing different stakeholders out- and inside company.	Aligning corporate values and project outcome; coordinating functions, processes etc. to achieve coherent customer experience.

2005; Topalian, 1979) putting them into an order suitable for the absorption process and complementing or omitting elements to match the situation of SMEs. The key capabilities of design management for the four stages of the DMAM are summarised in Table 7.

Socialisation of design knowledge

Design knowledge in the context of this thesis entails design processes, approaches such as human-centeredness, visualisation, experimentation, prototyping, etc., and tools as well as an attitude towards the creation of innovative solutions. During early phases of PACAP the use of design approaches and tools such as future customer personas, user scenarios, or customer journeys help to convert tacit into explicit knowledge (Nonaka, 1994). Since SMEs are close to their customers they have a wealth of tacit knowledge to inform designer's solutions once it is made explicit. The successful use of these approaches and tools represent a first step in the socialisation of design knowledge in SMEs.

While in the PACAP phases mainly CEOs or by appointed project managers are the ones absorbing new design knowledge, during RACAP more employees and management functions will have to be involved. Over time, socialisation of design knowledge might even have a prominent role in influencing company culture[55]. Again, the use of design tools by company members other than the CEO can act as a vehicle to introduce how designers work. Or the concrete cooperation of SMEs with external designers will trigger the absorption process of design knowledge in more depth. In the DMAM socialisation occupies the spot between PACAP and RACAP; it is a precondition that new design knowledge can be exploited at each company touch point. However, socialisation also is an on-going process right from the start of cooperation with a complementary knowledge source.

[55] See also the notion of design infusion as describe by Dumas & Mintzberg (1989).

- An indicator for the socialisation of design knowledge is the repeated *use of design approaches, concepts and tools* by more than one stakeholder. This can be something allegedly so small such as a human-centred perspective in the design of future company touch points.

Indicators for PACAP and RACAP

Indicators are evident outcomes of the design management absorption process and support the description and measurement of the progression of the design management absorption process. They also can be used as decision-points to guide the absorption process; they mark whether design management absorption has been "deep" enough to move forward. They are genuine design management instruments facilitate learning processes in SMEs.

- The first indicator is *design strategy* as part of the overall company strategy, which entails the envisioned added value of incorporating new design knowledge. It is an often-sketchy (nevertheless explicit) *hypothesis* of where a process and the absorption of design knowledge connected to it should take the enterprise. The commitment to pursue the design strategy triggers search and knowledge creation activities to understand the envisioned business opportunity.
- A *design briefing*, the second indicator, constitutes the assembled knowledge at this point in time, the direction and the scope of the design work. The briefing can be in a written or oral form and represents the condensation of strategic intent communicated to and re-worked by designers. The design briefing signals the commitment of the company to actually undertake design work.
- Indicators of a successful collaboration with a complementary design knowledge source are *design concepts* and *prototypes* of future product / service / experience outcomes.
- An indicator for a holistic understanding of design management as a multi-layered activity to achieve touch point orchestration is a *customer experience strategy*. For a SME with limited resources this might initiate a long-term transformation and exploitation of design knowledge throughout the company.

The following Table 8 introduces a rating with three levels to evaluate how well companies comply with the above-mentioned indicators.

Table 8: Rating system to evaluate compliance with indicators

	Design Strategy	Design Briefing	Use of tools /approaches	Design concepts / Prototypes	Customer experience strategy
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence					
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence					
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
Evidence					

Outcomes

Zahra and George (2002) described ACAP "as a dynamic capability pertaining to knowledge creation and utilisation that enhances a firm's ability to gain and sustain a competitive advantage" (p. 185). The same can result from absorbing design and design management knowledge if design resources are connected to value creating process of SMEs. Consequently, an external outcome of absorbing new design knowledge can be competitive advantage achieved through improved offerings and customer experiences.

There can be internal outcomes as well, which might be even more important because they have the potential to change a firm into a dynamic and flexible entity. Although scholars recognise that measuring dynamic capability is difficult (Ambrosini & Bowman, 2009a; Helfat et al., 2007), the DMAM proposes that an indicator for design management as a dynamic capability is a change of the resource-base of a company such as altered innovation processes or company structures that include designers or design managers. There also needs to be a "patterned element" (Helfat et al., 2007) in the way a company handles strategic as well as operational routine.

For the DMAM the following indicator to describe the outcome of the use of new design knowledge has been formulated:

- While in Zahra and George's (2002) model competitive advantage is an outcome of RACAP, it is out of the scope of this thesis to measure the financial return of improved company offerings. However, strategic flexibility can be assessed through the study of *internal effects of the use of design knowledge on the resource base* of the company such as altered innovation processes or structures, strategies, etc.

The Design Management Absorption Model is the critical framework, which will be used for the evaluation of the empirical data collected in an action research project (for details see the following Chapters 5, 6, 7, 8). The *indicators* as described before will be used to assess outcomes of the design management absorption process and will support the description and measurement of the progression of the design management absorption process.

In addition, to evaluate the individual case studies and to compare them the following research questions were developed:

- What internal and/or external impulses trigger the absorption process of new design and design management knowledge?
- What outcomes do the absorption of design and design management knowledge and the build up of design capabilities yield?
- Which specific design management and leadership capabilities have been developed during the absorption of new design knowledge?
- Are there specific barriers to the design management absorption process?
- Are there enablers that foster smooth design management absorption?

5 Methodology and data-collection techniques

The building blocks of the literature review all belong to the broader field of the social sciences. These entail disciplines such as psychology, sociology, anthropology, economics, and political sciences as well as many applied areas such as education, organisation studies, marketing and market research, health research, etc. All these disciplines and areas share the common goal of *studying human behaviour* (Punch, 2005). Also the design management studies are part of the social sciences. While the design discipline might have overlaps with e.g. engineering or IT of the natural sciences, design management mainly studies people's behaviour in connection with design mostly within organisations. This is why for this thesis methods of the social sciences were used.

Before the 60s *quantitative* research methods dominated the way social research was done. After, the interest in *qualitative* methods of social research grew – methods that had been marginalised until then – causing a "paradigm war" (Punch, p. 2) between *epistemological* views. The main result of this debate was a new awareness that the choice of methodology can also have political or ethical implications. While a positivist researcher believes him to be completely objective in his approach, e.g. a feminist researcher questions whether objectivity can exist in a society without equal level of power. However, apart from clashing value systems and paradigms, there can be more obvious reasons for the choice of a specific research method such as the theory used or practical considerations.

In this thesis *qualitative methods* of social research were used. Green and Thorogood (2009) describe qualitative methods as follows: "The most basic way of characterising studies is to describe their aims as seeking answers to questions about the 'what', 'how' or 'why' of a phenomenon, rather than questions about 'how many' or 'how much' " (p. 5). This statement fits the main objective of this thesis that is to understand *why* some SMEs with little or no prior design experience are more able to absorb new design management knowledge than others.

Furthermore, the *action research methodology* was chosen. Case study research might have been an alternative. However, the use of action research rather than case study research suggested itself because SMEs with little or no prior design experience do not have a lot of design expertise that could have been researched. Thus, for the most part the author of this thesis acted as a *change-agent* with the involved SMEs, while simultaneously observing how the companies reacted to the new knowledge.

In this chapter, some *fundamental notions* of social research are introduced such as the *positivist* vs. the *interpretivist* paradigm. Then qualitative methods will be characterised in more detail including the *inductive* vs. *deductive* way to build or test theory or quality criteria such as different forms of *validity*.

This chapter will also, generally, describe the *purpose*, *definitions*, *methodology* and *philosophy* of action research; and, more specifically, the *scope, sample of participating firms, stakeholders* involved, and *content* of this *action research proje*ct. Finally, *data collection* as well as *data analysis* techniques, and *problems* and *limitations of data analysis* are described.

5.1 Fundamental notions of social research

As mentioned before, there exist different epistemological traditions and assumptions "of what kind of knowledge they believe research should produce, or what counts as adequate evidence for conclusions drawn" (Green & Thorogood, 2004, p. 12). The *positivist model* assumes that scientific knowledge is obtainable only from sense data that can be directly experienced and verified between independent observers (Susman & Evered, 1978). It originated in the *natural sciences*, the study of natural laws; later, early psychologist and sociologist imitated the natural sciences using *quantitative methods* and experimentation to investigate social phenomena (Bryman, 2008; Punch, 2005)

However, it can be questioned whether the methods of the natural sciences are able to produce knowledge about people and social behaviour (Green & Thorogood, 2004). Susman and Evered (1978) list the deficiencies of the positivist model as follows: "it assumes that its methods are value neutral"; "it treats persons as objects of inquiry"; "it eliminates the role of history in the generation of knowledge"; "it assumes that a system is defined only to the extent that a denotative language exists to describe it"; and "it is itself a product of the human mind, thus knowledge of the inquirer cannot be excluded from an understanding of how knowledge is generated" (p. 585/586).

Another notion, the *praxis model* as compared to a positivist model of pure research can be traced back to Aristotle who used the term *praxis* to describe the "art of acting upon the conditions one faces in order to change them" (cf. Susman & Evered, 1978). Aristotle contrasted the praxis approach with the one from other scientific disciplines that aim at knowing for its own sake. Bryman (2008) makes a further distinction: quantitative approaches aim at *explaining* phenomena, while qualitative approaches intend to *understand* them. Both do have their legitimate place depending on the purpose of research but if the purpose of research is one of understanding human behaviour, then an in-depth interpretation is central.

The so-called *interpretative approaches* of social research entail schools such as: *phenomenology* (phenomena are real because they are treated as real), *social constructionism* (reality is socially constructed and a result of history, social and political circumstances), *critical approaches* as e.g. developed by feminist researchers (research cannot be free of values because it is a social process), and *collaborative or participatory approaches* that use and reflect on the relationship between researchers and the researched such as communities, organisations, etc. (Green & Thorogood, 2004).

Green and Thorogood (2004) also describe the following *research strategies*[56] of qualitative social research:

- Naturalism: an interest to study people in everyday life or in real life contexts
- Reflexivity: values are part of the research process but they must be reflected on. This involves reflecting on the research itself, how the context impacts on the research, or the role of the researcher.
- Focus on meaning and understanding: Search for the reasons and the meanings for certain behaviours not for the deficiencies
- Flexible research strategies: Overlap of literature review, research design, data collection and analysis, and writing up

Also the *roles* of a researcher can differ depending on qualitative and quantitative approaches. There are seven *faces* or roles (Eilon, 1974) of researchers: the chronicler, the dialectician, the puzzle-solver, the empiricist, the classifier, the iconoclast, and the change-agent. The main interest of the first six researchers is to understand a certain system, while the last one aims at understanding a n d changing it. Also: The first and the last archetype represent two complete opposites.

While chroniclers are clearly connected to a positivist paradigm of research, completely detach themselves from the object of their research and merely observe, change-agents immerse themselves in the (inter-)action and try to catalyse something in the environment they have chosen to research. Each archetype has a contribution to make to research; however, each has also certain limitations and weaknesses, "with implications for the ability to generalise and advance our knowledge in the field of management science" (Eilon, 1974, p. 9).

Bryman (2008) makes the following juxtaposition of *qualitative* vs. *quantitative* research approaches as displayed in Table 9. Quantitative approaches are rooted in a positivist and objectivist view of research assuming that social phenomena have a life of their own independent of social actors. In addition, quantitative researchers mostly create new knowledge *deductively* by going from existing theory to the formulation of hypotheses, to the collection of data, and ensuing findings, to the confirmation or rejection of the hypotheses, and, finally, to the revision of theory.

Inductive logic, on the other hand, starts from the data and looks for regularities and patterns that are generalizable. However, most researchers use both logics, so qualitative research is rarely purely inductive. Green and Thorogood (2004) state, "studies that have the broad characteristics of one research strategy may have a characteristic of the other" (p. 23).

[56] A research strategy is a general orientation to conduct social research (Bryman, 2008).

Table 9: Comparison of qualitative and quantitative research approaches

	Quantitative	Qualitative
Principal orientation to the role of theory in relation to research	Deductive; testing of theory	Inductive; generation of theory
Epistemological orientation	Natural science model, in particular positivism	Interpretivism
Ontological orientation	Objectivism	Constructionism

Any kind of research tries to advance the knowledge in a specific field. Actually, there exists a "circular" relationship between theory that is able to *explain* data, and data that are able to *build* and *test* theory (Punch, 2005). The pre-empirical stage (e.g. the review of state-of-the-art literature) will lead to a research question and establish what data is needed to answer the question. There follows the research design, through which data is being collected and analysed at the empirical stage.

To draw conclusions from findings or results *rigour, neutrality* and *a critical distance* (Green & Thorogood, 2004) are needed; this is a fundamental law of any kind of empiricism (Bryman, 2008). One important criterion to measure up to is the one of *validity*. It is concerned with the "integrity of conclusions that are generated from a piece of research" (Bryman, 2008, p. 32). Bryman (2008) summarises the following subcategories of validity:

- Measurement validity or construct validity: applies mainly to quantitative research; does a measure from a concept denote what it is supposed to
- Internal validity: deals with the question whether there really exists a relationship between cause and effects observed
- External validity: is about the question whether results can be generalized beyond a specific research context
- Ecological validity: deals with the question whether specific findings can be applied to people's everyday, natural social settings

More criteria will be introduced in the Chapter 5.3 on action research; in addition to the traditional criteria of validity or credibility, transferability, dependability, confirmability also ethical ones apply.

To close this chapter we shortly introduce the most important data collection methods of social research:

- Case studies: investigate a contemporary phenomenon within its real-life context; when boundaries between phenomenon and context are often fuzzy; multiple sources of evidence are used (Yin, 2009). There can be single case studies to elaborate on a phenomenon and multiple case studies that lend themselves to comparison.

- Ethnography: participates in peoples daily lives, observes, listens to what people say, asks questions with the aim to understand "culture as a shared set of meanings" (Punch, 2005, p. 163).
- Grounded theory: is a method that develops theory inductively from data through an iterative process of collecting and analysing data until a saturation of theory is reached (Punch, 2005).
- Action research will be defined in detail in the following chapter.

5.2 What is action research

Real world research commonly has three central purposes: to *explore*, to *describe* and/or to *explain* (Robson, 2011); each purpose might form the focus of one project. Action research goes one step further, though. It does not only intend to explore, describe and to explain but to "*facilitate* action, to help change or make improvements, to influence policy or practice" (p. 39). This approach is especially attractive in those research areas of social life where empowerment or emancipation may be necessary with respect to questions of social class, gender, race, age, sexuality etc. This is why this method, in the 70s, was acclaimed by feminist research or by the critical theory of Marcuse or Habermas (Robson, 2011).

Several authors (Gray, 2009; Reason & Bradbury, 2001) state that the origins of action research are not completely clear; nevertheless, they acknowledge that Kurt Lewin's work in the late 30s and 40s in the US is one of its starting points, where he and his students got involved in community projects with the intention to not only study group dynamics and social behaviour but to *change* the situation people were working and living in (Adelman, 1993). Lewin (1946) aimed at raising the self-esteem of minority groups such as factory workers and formulated the following definition of action research:

> It is a type of action-research, a comparative research on the conditions and effects of various forms of social action, and research leading to social action. (p. 35)

The system is being studied while in the process of change; theory is being derived from the observed social changes as well as from the effects of the researcher's interventions on the system. Or: "The prime objective is to change a system by being part of the system" (Eilon, 1974).

During World War II, action research also evolved in Great Britain, a fact that led to the Tavistock Institute of Human Relations. One of the first projects in the UK was the civil repatriation of prisoners of war (Susman & Evered, 1978). Since the 70s a

need for action research was also proclaimed in the areas of organisational sciences (Susman & Evered, 1978) and more specifically strategy research (Platts, 1993).

Action research aims at the development of competencies of its members and, therefore, can be described as an „enabling science" (Susman & Evered, 1978). Another definition of action research is that of Rapoport, 1970 (cf. Susman & Evered, 1978):

> Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goal of social science by joint collaboration within a mutually acceptable ethical framework. (p. 587)

A distinctive feature of this research methodology is the tight theory-practice relationship. Reason and Bradbury (2001) name the following characteristics of action research: It is an emergent developmental form of research, centres on practical issues, aims at human flourishing, is indebted to participation and democracy, and emphasises the creation of knowledge in action. Other authors put action research in the broader perspective of the differing research paradigms mentioned before (O'Brian, 1998; Susman & Evered, 1978).

Susman and Evered (1978) see action research even as a corrective to the positivist model by being future oriented, collaborative, situational, agnostic, implying a development of the system and generating theory grounded in action[57]. O'Brian (1998) states:

> That knowledge is derived from practice, and practice informed by knowledge, in an on-going process, is a cornerstone of action research. Action researchers also reject the notion of researcher neutrality, understanding that the most active researcher is often the one who has most at stake in resolving a problematic situation. (n. p.)

Another distinctive feature of action research is the *active participation* of those who are at the centre of research in a collaborative process. Lewin (1946) defined this process as a "spiral process of steps each of which is composed of a circle of planning, action, and fact-finding about the result of action" (p. 38). Adelman (1993) summarises Lewin's process in the following way: The group discusses the problem to be solved and takes a decision on how to proceed; it will monitor and keep note of the consequences and the progress of the project. The group will also decide when a strategy will come to an end, fulfilled or come to nothing.

For organisations Susman and Evered (1978) propose the following five-step process (see Figure 14). According to them the client system (centre of the model) maintains and regulates some or all of the five phases of diagnosing, planning action, taking action, evaluating, and specifying learning. O'Brian (1998) states that action

[57] At the beginning of their paper, the authors bemoan a crisis in organisational science, which so far had heavily relied on the positivist model. Research „only remotely related to the real world of practising managers and the actual issues, with which members of organizations are concerned" (Susman & Evered, 1978 ,p. 582).

research is a holistic problem-solving activity not a single research approach and lists the following methods, which all pertain to qualitative research:

- Keeping a research journal
- Document collection and analysis
- Participant observation recordings
- Questionnaire surveys
- Structured and unstructured interviews
- Case studies

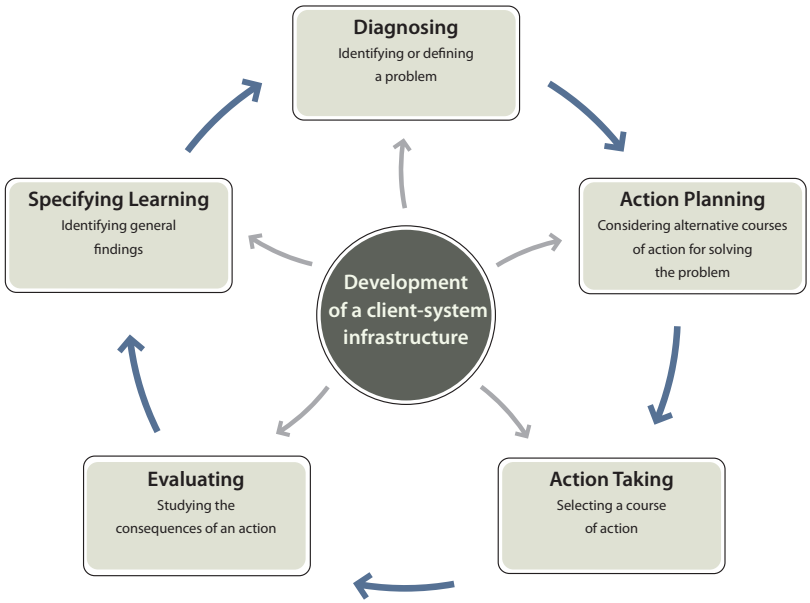

Figure 14: Cyclical process of action research (Susman & Evered, 1978)

While action research has been on the rise since the 70s in the areas of organisational, strategy and design studies, this method also raised questions of its validity as proper research. Eilon (1974) points to two main problems of action research:

1. One of ethics: Does the researcher (change agent) have the right to intervene?
2. One of role: Can action research actually still be named research?

Taking up on the issue of role and ethics of the researcher, Eilon (1974) distinguishes between two forms of change agents: a. the catalyst who „is careful not to impose his views or to challenge current procedures and constraints in a blatant fashion" and b. "the activist, who takes action to steer the system towards solutions by making them explicit proposals, by arguing advantages of his solutions, even participating in the responsibility of implementation" (p. 8).

Rapoport's (1970) definition claims that action research needs to take place within an ethical framework. To underpin ethical research behaviour *principles* of action research have been formulated (O'Brian, 1998):

- Make sure that the relevant persons, committees and authorities have been consulted, and that the principles guiding the work are accepted in advance by all.
- All participants must be allowed to influence the work and the wishes of those, who do not wish to participate, must be respected.
- The development of the work must remain visible and open to suggestions from others.
- Permission must be obtained before making observations or examining documents produced for other purposes.
- Descriptions of others' work and points of view must be negotiated with those concerned before being published.
- The researcher must accept responsibility for maintaining confidentiality (p. 7).

To answer the question whether action research is a scientific method or not, Susman and Evered (1978) state that the legitimacy of action research cannot be judged from a positivist viewpoint because the philosophy of the two models differ greatly. They propose alternative criteria and methods of science contrasting the following points:

- Explanation versus understanding: While the positivist model defines a covering law, under which certain forms of behaviour fall, in action research behaviour is explained using a phenomenological perspective.
- Prediction versus making things happen: While the positivist researcher will build conditions to make sure that he will not interfere with the research setting, the action researcher will actively contribute to solutions of the client system. The positivist research will make predictions. The action researcher will cooperate to purposefully bring about a good solution.
- Deduction and induction versus conjectures: Most significant knowledge about social systems has grown out of conjectures rather than the logical reasoning of deduction or induction. By taking action such conjectures will be strengthened or weakened.
- Detachment versus engagement: Valuable and practical knowledge for clients can only be developed through empathy, taking the role of the other or participant observation leading to real understanding of the values that guide and inform the client system.

- Contemplation versus action: Action research „not only is knowledge gained by acting in the real situation but the situation itself is simultaneously a product of the current level of knowledge“ (p. 599).

Susman and Evered (1978) come to the conclusion that action research is a different form of science, with a different epistemology, a different form of knowledge supporting "the capacity of members of the organisation to solve their own problems" (p. 601).

5.3 Why was action research chosen

As stated before, the goal of a study will dictate the research strategy. It will also be influenced by the theory used, by practical considerations, the epistemological orientation of the investigators, their values and ontological orientation (Bryman, 2008). The two main reasons for the choice of action research were: This method has a strong overlap with design practice as well as design research, and is also used in the field of organisational research. And: To obverse change or organisational learning a learning process needs to be catalysed at first.

Since its origins in social psychology, action research "migrated" to other fields such as the management sciences (Moultrie et al., 2007a; Susman & Evered, 1978), or to the design studies (Frayling, 1993/4). Frayling's famous distinction of *research into, for and through design* connects the latter to action research, "where a research diary tells, in a step-by-step way, of a practical experiment in the studios, and the resulting report aims to contextualise it" (p. 5).

While in Frayling's definition action research takes place "in the studios" (p. 5), and thus refers to the development of a designed outcome and the documentation of the process that led to it, in this PhD project not only the outcomes that resulted from the design-driven innovation processes were analysed but also the organisational learning and design management absorption process that accompanied it.

Apart from action research, also *case study research* might have been used for this applied research project. Case study research has extensively been used in the social sciences, management sciences, law, or medicine (Breslin & Buchanan, 2008; Yin, 2009). These are all fields, where researchers want to "understand a real-life phenomenon in depth" (Yin, 2009, p. 18), which is certainly true for research in an organisational context. In fact the outcomes of the individual company projects are presented as case studies in the results section.

However, before the analysis of each single case study, the author of this thesis has systematically collaborated with the involved SMEs in a participatory way by assuming a change-agent role, right from the start. Each innovation or design project

constituted a "problem" being resolved through the characteristic steps of action research of *diagnosis*, *action planning*, *action taking*, *evaluation,* and *specifying learning*.

To deal with possible shortcomings of the action research approach, a "safety system" was implemented into the research design by adding an external validation loop to it. The *action research* with the companies (part 1) was combined with the *assessment of the practical value of the design management absorption model* through expert opinions (part 2) as a separate iteration of the stage of specifying learning during the action research cycle (see later Figure 16, Chapter 5.5).

The backdrop to the choice of using the action research approach was also the state of the art of design research at this point in time. It is only approximately 10 years that design studies and more specifically design management studies are getting more interested in what design and design management can catalyse in non-profit organisations like the healthcare system or companies in regard to organisational change rather than to designed outcomes.

This implies that researchers have to get involved in companies and organisations to make the change happen as well as to observe it. Furthermore, the selected research method had to be helpful to analyse situations at the overlap of organisational and design studies.

5.4 Details of action research project

The action research project, which is the empirical foundation of this doctoral thesis, has been taking place in two of the less industrialised regions such as Central Switzerland and the region of Berne. These regions were the "providers" of eight SMEs taking part in the project.

As in any other European country Switzerland is home to many SMEs (see also Chapter 3.). 311'000 organisations or nearly 99.6% of all companies are micro, small or medium-sized[58]. The highly industrialised centres with large or smaller high-tech companies are located at the borders of Switzerland in the regions of Basel or Geneva, where the country is neighbouring Germany or France (Keupp & Gassmann, 2009) with an additional strong cluster, the finance sector, in Zurich.

Governmental economic programmes, regional chambers of commerce, managed cluster organisations, knowledge transfer organisations, Universities with an emphasis on the Universities of Applied Sciences and Arts, and of course the companies themselves make up the innovation system of Central Switzerland and the Berne region.

These two areas are also the beneficiaries of a governmental economic programme called New Regional Policy (NRP) that supports initiatives (not companies!)

[58] http://www.bfs.admin.ch/bfs/portal/de/index/themen/06/02/blank/key/01/groesse.html (retrieved 23 Sept. 2012)

that work to increase the economic viability of the regions lacking infrastructure, regional networks, or know-how. This programme aims at giving impulses, developing unique selling propositions (USPs) in the regions, connecting the cities to the rural areas, etc. One such initiative is Swiss Design Transfer (SDT), a regional not-for-profit design support centre for Central Switzerland and Berne; it has been subsidised by NRP since autumn 2008 to sensitise SMEs to design as a strategic resource.

Another category of regional stakeholders is cluster organisations. In the case of the Berne region, there exist several clusters supported by local authorities, one entailing med-tech companies – quite a strong national USP of overall Switzerland – or the precision cluster comprising many companies from the Swiss watch industry. Another player of the innovation systems of Central Switzerland and the Berne region are as mentioned before knowledge exchange organisations supported by the regional authorities, the Universities of Applied Sciences and Arts, or the University of Berne.

The two Schools of Art and Design operating in these regions have not been providing strategic design advice to SMEs until a few years ago. In 2008, the author of this thesis started to focus on SMEs with little or no prior design experience in her applied research (Acklin, 2010; Acklin & Hugentobler, 2008). Work with these companies revealed quite clearly that many small and medium-sized companies hardly had any design knowledge and, thus, had few design management capabilities.

5.4.1 Scope of action research project

The action research project aimed at developing innovation projects with eight SMEs with little or no design experience within a time span of two and a half years (2010-2012). The companies were guided through a design-driven innovation process[59] starting with assessing current impulses from within and from their ecosystems, formulating a preliminary innovation hypothesis or design strategy, developing a research plan, if possible undertaking appropriate research and analysing the data, formulating a design brief, going through concept development and prototyping, and, finally, the development of the necessary internal and external measures to launch the new product, service, or customer experience.[60] If necessary, companies were supported by Swiss Design Transfer to source a designer, before or during innovation processes.

While the scope of the project for SMEs was mainly about "getting things done" and developing an innovation that was novel to the company, the academic goal was *to describe and analyse the progression of design management absorption during their innovation processes* (not to investigate the innovation processes the companies went through as such, see Chapter 6, Results).

[59] See model introduced on p. 116.
[60] The content of the project work with the companies will be introduced in more detail later.

5.4.2 Sample of companies participating

The action research project started with a first batch of companies in early 2010 and a second batch at the end of 2010. Overall, eight companies and organisations took part in the project funded by a Swiss research foundation that encourages universities to cooperate with companies, which are not close to research institutions (Table 10).

Table 10: Companies, trade, employees, scope of project

Name of company	Trade	Number of employees	Scope of innovation project
Zimmermann Technik (Later: Ledagio)	Electrical engineering (Later: Manufacturer of lamps)	60 (before) 6 (After founding spin-off)	Redesign and repositioning of an LED outdoor lamp
Vaporsana	Manufacturer and retailer of steam showers	10	Reengineering, redesign and repositioning of a steam shower
Sistag	Manufacturer of industry valves	138	Redesign of brand architecture and communication media incl. development of a service organisation
Stiftung Schürmatt	Care for people with special needs	250	Development of a customer experience targeted at local authorities and politicians
Schreinerei Bieri	Carpenter (kitchen)	20 (Including 5 apprentices)	Development of a carrying case that is able to unfold into a small working space for construction sites with no infrastructure
Studer Maschinenbau	Manufacturer of industrial machinery	17	Reorganisation of structure, processes, workforce; search for new business opportunities connected to core technology; development of a communication strategy to push new products to the market
Alpnach Norm	Industrial carpenter (built-in closets)	160	Development of a sideboard system
Tofwerk	Manufacturer of mass spectrometers	27	Development of a branding strategy for a high-tech OEM product (and market)

The criteria for the participation of a SME in the action research project were:

- A project that was novel to the company: a new product, service, or customer/brand experience. The novelty of the project for the market, e.g. a plan for a radical innovation, was not a condition.
- The willingness of the company to engage in the design-driven innovation process as proposed by the researchers to develop something new (this included the cooperation with the researchers).

- The willingness to include external design expertise when necessary, to commission it and to pay for it.

The eight companies were invited to participate irrespective of trade or target group. That's why the group of companies as outlined in Table 10 is not based on sectors but on their "need" to learn about design and design management. The sample contained companies from different sectors such as the consumer as well as from the industrial goods sector; one organisation was a foundation for the care of people with special needs.

5.4.3 Involved stakeholders

Fehler! Verweisquelle konnte nicht gefunden werden. displays the stakeholders involved at each stage and their role during the action research project. The stakeholders were from the outside in:

- Research: The author of this thesis was leading the project and was present at each stage. She is the head of a research group, the Competence Centre Design and Management at the Lucerne University of Applied Sciences and Arts – School of Art & Design and involved other group members with specialisations such as product language or sustainable development, when their expertise was required. Their inputs took place within the predefined setting of this action research project.
- Swiss Design Transfer (SDT) promotes design as a value creator for organisations. It is a spin-off of the above mentioned research group, supports SMEs and occasionally connects companies to the school. SDT does not provide any design services itself but explores the potential benefits design can contribute to the companies with the companies.
- Professionals from design agencies from the creative industries: SDT facilitated the search and the selection of an agency that would provide the right design expertise for the individual company project.

- SMEs of different trade and sizes (see Table 10).

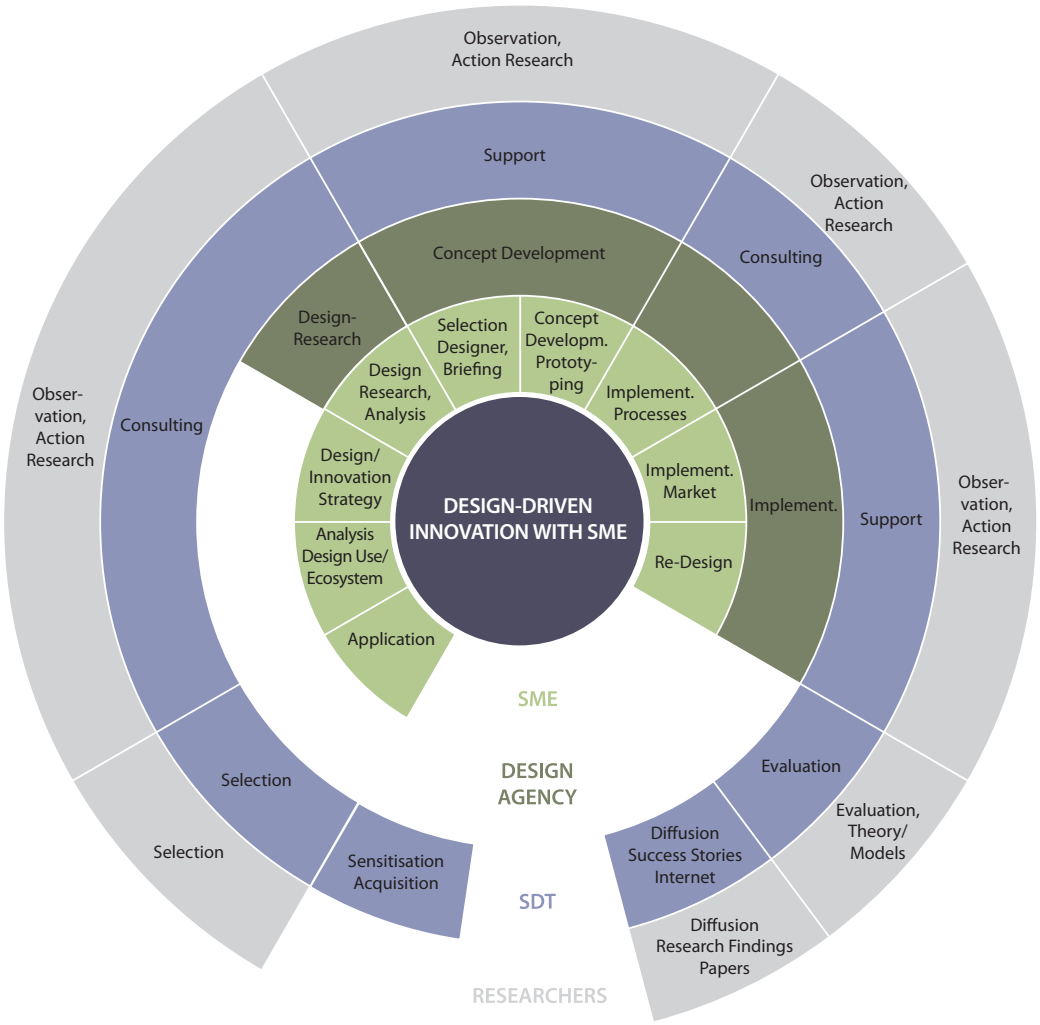

Figure 15: Involved stakeholders

5.4.4 Content of cooperation

Overall, 81 workshops including evaluations with the eight involved companies, many more informal meetings and talks, or the exchange of e-mails and phone calls took place. Table 11 at the end of this chapter gives an overview over the number of workshops, the duration of the collaboration with the author of this thesis, and the final outcome.

Most of the time, first contacts with the companies had occurred before the start of the action research project. During initial talks, companies were introduced to the basic conditions of the collaboration and to the benefits of using design in their

innovation activities. Some companies had attended an information event of Swiss Design Transfer, where best practice examples of SMEs using design were presented. After an at least superficial *valuation* of the potential benefits of using design, the SMEs decided to give the cooperation with author of this thesis a try.

At the beginning, companies were familiarised with the design-driven innovation process model[61], since the succession of the phases of *impulse*, *research*, *development*, *strategy*, *implementation* and *re-design* was the intended blueprint for the innovation processes. Depending on the nature of projects, resources, or commitment some companies followed the prescribed process; some others lingered on some phases longer than others, sped up on some, or back looped into prior ones.

A first one-day workshop was the same for 7 out of 8 SME[62]. A design management assessment tool was used to analyse the strengths and weaknesses of the present use of design of the company[63]. Results from the work with the Design Management Travel Guide (the name of this design management assessment tool) would include an identification of the design use and knowledge or the lack thereof, an analysis of where the main competitors are in relation to the company, desirable outcomes in the field of the offerings as well as the positioning of the company, etc.

Based on the initial analysis companies defined a more or less *sketchy hypothesis or design strategy* for their project and formulated issues to be worked on (e.g. user or technological insights). Most SMEs were unfamiliar with qualitative research methodologies such as user research; they mostly lacked the time or the financial resources to actually undertake it. So only a limited number of SMEs engaged in qualitative research. Nevertheless, all companies were able to develop current or future customer personas out of tacit, everyday knowledge.

Tools introduced at this stage were:

- Current and future customer personas
- Current and future brand personas
- Product personas
- User scenarios
- Mood boards
- Customer journeys
- Etc.

During workshops, also design management approaches were introduced with the end to support the absorption of design management capabilities. The knowledge created during these workshops would most of the time become an element in briefings to

[61] See also model introduced on p. 116.
[62] There was one exception: One firm did not build on their existing firm but was pondering the idea to found a new one right from the start.
[63] In prior research, the "Design Management Travel Guide" (Acklin & Hugentobler 2008), a visual design management assessment tool based on the Danish concept of design maturity was developed (paper see Appendix).

commission design work. The sourcing of "the right designer" and, later, the productive communication with external designers was often a central experience during innovation processes.

Table 11: Comparison of duration of projects, numbers of workshops conducted and individual outcome

Company	Duration of collaboration[64]	Number of workshops	Outcome
Stiftung Schürmatt	11 months	8 (plus 2 evaluations)	None
Ledagio	8 months	6 (plus 1 informal meeting and 2 evaluations)	New outdoor lamp
Studer Maschinenbau	14 months	8 (plus e-mail exchange and 1 evaluation)	Change of organisational form and an improved product, communication, and brand strategy
Tofwerk	8 months	4 (plus 1 evaluation)	Branding strategy in form the form of a shield for the product
Schreinerei Bieri	8 months	4 (plus 1 evaluation)	None
Sistag	23 months (for the period of nearly 11 months the company was working with a branding agency without involvement of the author of this thesis)	12 (plus 1 for evaluation)	New corporate identity and brand architecture complemented by a concept for a service organisation
Vaporsana	27 months (including a time lag of five months during the first year of cooperation)	16 (plus 1 for evaluation)	New steam shower
Alpnach Norm	13 months	13 (plus 1 for evaluation)	New side board system

Cooperation with the author of this thesis could take on different forms of intensity and duration (see Table 11). In some cases, companies would start their collaboration with a design partner early on and, from that moment on, "used" the author of this thesis only for feedbacks on an occasional basis. Some would cooperate with the author of this thesis all the way to the launch of a new product (3 companies), to the launch of a new corporate identity and brand architecture complemented by a concept for a service organisation (1 company), to the change of organisational form and an improved communication, brand strategy and improved product (1 company), to an improved product with a branding strategy connected to it in the form of a shield for the

[64] First contacts and meetings to agree on scope of projects are not included in calculation.

product (1 company); two stopped their projects before producing any commercial outcomes.[65]

These differences in intensity and duration were mostly caused by the companies' willingness or unwillingness to proceed with projects (and implicitly with embedding new design knowledge). Nevertheless, the author of this thesis kept in touch with all of the CEOs in order to trace the process of decision-making and evaluated all the projects with them, also the ones that were stopped.

The shortest collaboration between author of this thesis and company lasted 8 months, the longest 27 months (including in some of the projects time lags of differing duration). Time lags during company projects were mostly caused by external factors such as waiting for the response of the government for project funding.

5.5 Data collection techniques

The research project was divided into two parts: A big one of action research with the eight companies cycling through the five phases of the action research as described in Chapter 5.1; and a small one entailing a survey via e-mail about the practical value of the model with a group of experts from practice and academia (Figure 16, overleaf).

The first three phases of the action research cycle (diagnosing, action planning and action taking) extended over a period of over two years (details see in Chapter 5.2.4). At the end of phase 4 (evaluating) companies were interviewed about the results of their innovation projects. They were also invited to specify lessons learned (phase 5). For this purpose, at the end of evaluation talks, the Design Management Absorption Model was introduced as a framework to discuss how far companies had progressed in the absorption of design management knowledge and how this had impacted on their resource base.

Questions asked were:

- What triggered the decision to cooperate with the author of this thesis?
- What were the (physical) outcomes of the project?
- What did the project change related to strategies, processes, or culture?
- What tools and design approaches have they been using again since?[66]

[65] The different forms of intensity of company did have an impact on the depth of knowledge absorption but did not hinder the evaluation of

[66] A German version of the questionnaire can be found in the Appendix.

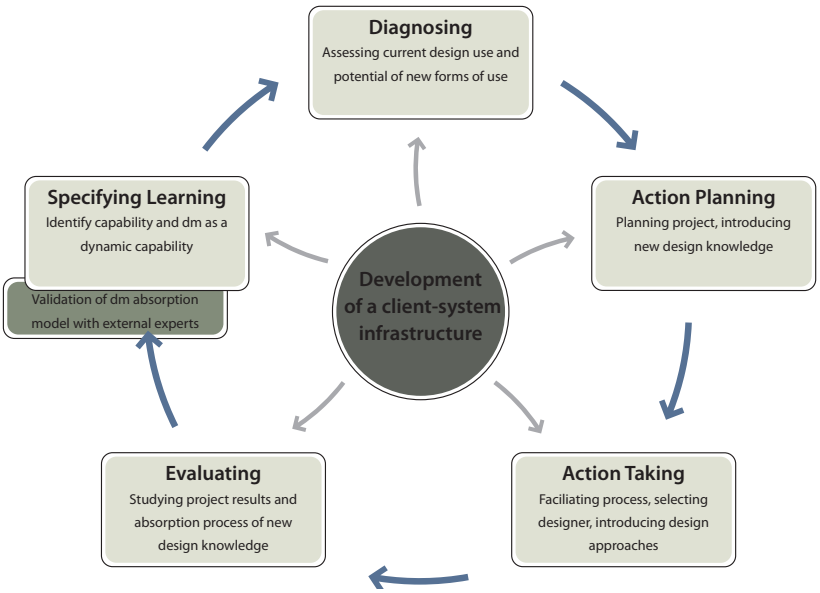

Figure 16: Data collection based on action research cycle

To support the discussion during final evaluation and to specify company learning a *narrative version of the DMAM* was used (see Figure 17 after section 5.5.1 Documentation). After having been introduced to the model, companies were asked to position themselves on the DMAM and to reflect on how far they had progressed. The author of this thesis would as well make an assessment of absorption progression based on her analysis; in some cases this resulted in a *gap of perceptions on how deeply the company had* absorbed design management knowledge.

For most of the case studies also *talks with the involved designers* were held to understand their perception of the process and of special occurrences such as conflicts during innovation projects. Their view helped to *triangulate* perceptions (Yin, 2009) and to objectify the analysis of the author of this thesis because designers often worked intensely with the companies without the presence of the researcher.

The external validation of the Design Management Absorption Model (specifying learning) intended to evaluate the practical value of the model by experts, which had not been involved in the action research project. Experts commented on the usefulness of the model as a generic tool to track design management absorption and on the target groups for a future use of the model.

In short, there exists a rich database for data analysis encompassing all of the above-mentioned materials developed during the project as usual in action research methodology (see Chapter 5.1.):

- Minutes from single workshops with companies (Wiki)
- Materials resulting from workshops (digital database)

- Evaluation interviews transcripts with companies
- Company's mapping of design management absorption on narrative DMAM
- Talks with designers

These materials will be referred to as *evidence* supporting the analysis of the individual case studies and the cross-case comparison and will be mentioned in brackets in the results section.

5.5.1 Documentation

As required by the action research methodology all events involving the author of this thesis and companies were documented: There exist *minutes* of each single workshop and some of the informal talks over the phone or the exchange of e-mails on *a wiki*. The wiki's menu contains an overall chronology of the project listing, which workshop of which company did take place at which date and with whom participating, and a section for each of the eight companies.

Each workshop was documented following the same "regime":

- Agenda of workshop
- Methods/approaches used
- Results of workshop
- Next steps
- Additional observations

The last point on the menu was open to all kinds of observations like notes on the process, on sudden developments, group dynamics, etc. It also contained reflections on design and design management capabilities that had been missing during the workshops by company members, or others that – unexpectedly – had been there.

Additional materials from workshops such as photo protocols of written results on flipcharts, documents (e.g. briefings), collections of photos (e.g. of prototypes, flip charts), etc. were saved to a *digital database*. Apart from the project documentation, a *final evaluation interview* using a semi-structured questionnaire was conducted with each company, *recorded on tape* and transcribed into a roster using categories and themes connected to the research questions.

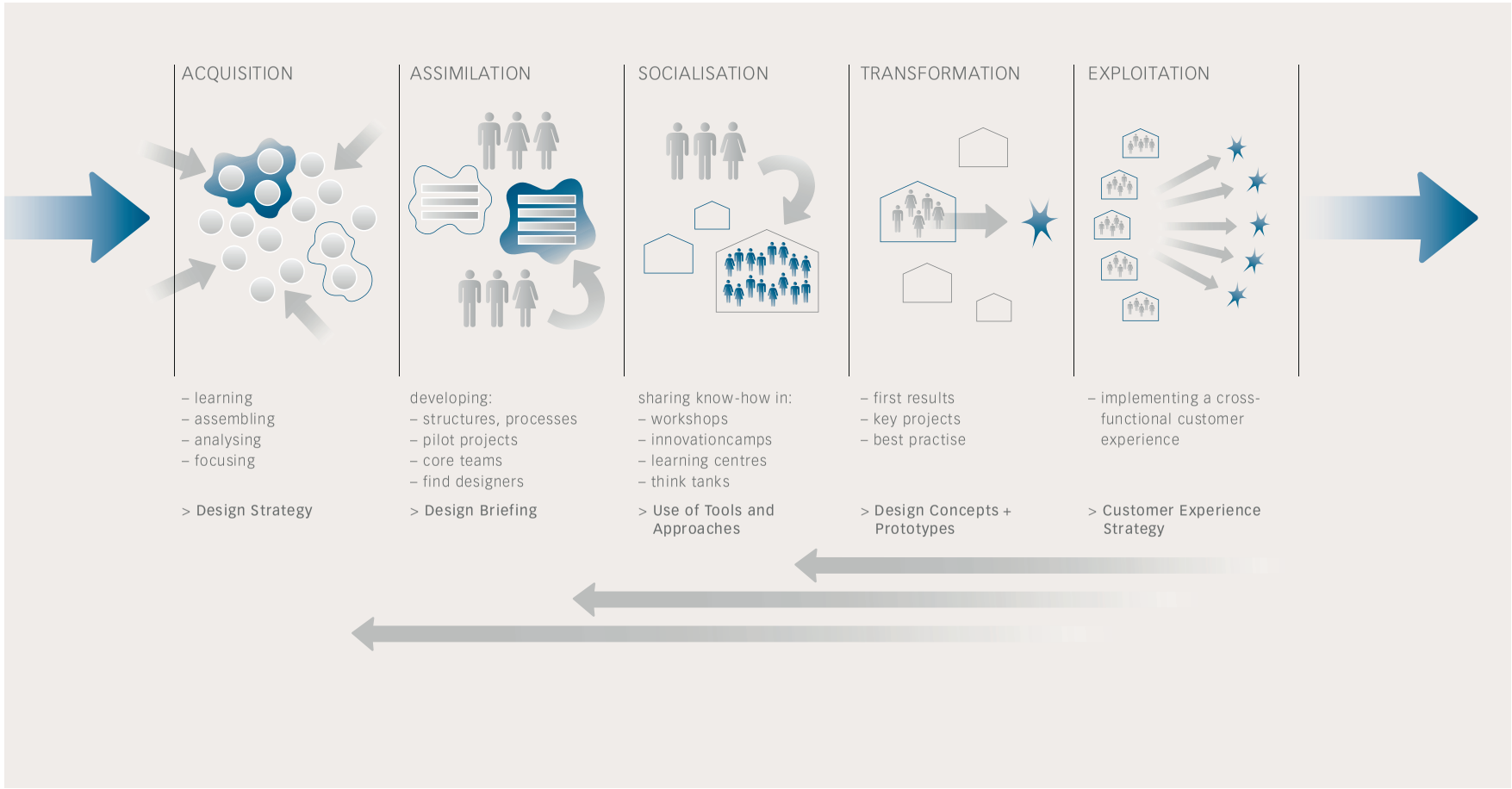

Figure 17: Narrative version of Design Management Absorption Model

As stated before, this model was used during final evaluation with companies. It was introduced at the very end of the interviews as a means to discuss and specify learning from the innovation projects. *To specify learning* is the final step of the action research cycle (see Chapter 5.1.1).

5.6 Data analysis techniques

Data analysis can entail two levels: one of *describing* what is or what was and one of *explaining* it. The first step will lead to the summary of discrete *facts*, the second to empirical *generalisations* (Punch, 2005). Huberman and Miles (1994) describe the research process as an interaction of data collection, reduction, display, and drawing or verifying conclusions.

Also in this thesis data analysis can be described as an interaction of data reduction and display, drawing first conclusions, interpreting the data again and extracting generalizable insights. Data analysis, thus, was undertaken in the two steps of:

a) A *level 1 analysis* describing how the companies absorbed design management knowledge and comparing companies with respect to their design management absorption (see Chapter 6. Results)

b) A *level 2 analysis* extracting generalisations based on the level 1 analysis. These generalisations are formulated in the form of *themes* and a *Typology of Design Management Absorbers* (see Chapter 7. Discussion).

The critical framework, the Design Management Absorption Model (see p. 120), its categories and indicators were used to structure the results and to trace correlations between categories. According to Punch (2005), a critical framework denotes "the main concepts or variables, and their presumed relationship with each other" (p. 53). *Indicators* were used to tap concepts that are less quantifiable; they function as a measure of a concept (Bryman, 2008).

The research questions formulated at the end of the literature review (Chapter 4.4.2.) underpinned the data analysis giving it direction and depth. A table (Table 32) at the end of Chapter 7 summarises, in which section of Chapters 6 and 7 the research questions were addressed (Chapter 7.1.6).

- What internal and/or external impulses triggered the absorption processes of new design and design management knowledge?
- What outcomes did the absorption of design and design management knowledge and the build up of design capabilities yield?
- Which specific design management and leadership capabilities were developed during the absorption of new design knowledge?
- Were there specific barriers to the design management absorption process?
- Were there enablers that foster smooth design management absorption?

Here follows a description of the approaches and techniques used during level 1 and 2 analysis.

5.6.1 Level 1 analysis

For the analysis of each of the eight case studies the following approaches and techniques were used:

1) A *descriptive approach*: Each individual case study opens with an *introduction* to the company and to the circumstances surrounding its innovation projects. For this, the *minutes* of all the workshops and additional materials were reviewed and summarised in an account of "what was". A detailed *table summary* of all workshops conducted between the company and the author of this thesis listing design activities, design approaches and tools introduced, most important outcomes of each workshop and special observations can be found in the Appendix A.1. Final evaluation interviews with company members were structured using a thematic roster.

2) An *analytical approach* with the help of the Design Management Absorption Model (for details see Chapter 4.4.). The DMAM was used to *analyse* and *rate* the companies' progression following the categories of the critical framework.

1. Triggers
2. Acquisition
3. Assimilation
4. Socialisation
5. Transformation
6. Exploitation
7. Outcomes

The progression of design management absorption was rated using a scale for each of the *indicators* (see Table 12, overleaf) with the scores of "full success", "good enough" and "complete failure".

Table 12: Rating scale to evaluate compliance with indicators

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence					
Good enough	Potential of design recognise, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence					
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
Evidence					

There follows a *discussion* of the company's progression of design management absorption based on the self-assessment of the progression as pointed out by the CEOs or other company members during evaluation talks as well as the analysis of the author of this thesis. In some cases this will result in a *gap of perceptions on knowledge absorption*, which is also indicative of the actual *absorption gap*.

3) The last step of the level 1 analysis consists in a *cross-case comparison* mapping companies' individual design management absorption progression on one figure (Figure 29) and summarising the ratings of design management absorption progression from the eight individual case studies using again the categories of *acquisition*, *assimilation*, *socialisation*, *transformation*, and *exploitation* of the DMAM as a reference (Table 30). In doing so *patterns*, either *similarities* or *differences* of companies' absorption progression could be traced and made accessible to a first *interpretation*.

5.6.2 Level 2 analysis

While the emphasis of the level 1 analysis was mainly on the question *how* far had the design management absorption progressed in each company, and partly *why* some

companies progressed further than others, the *level 2 analysis* aimed at *explaining* some of the phenomena from the cross-case comparison in the form of *generalizable insights*. These *insights* emerged from analysing *correlations* between categories of the critical framework and/or actors of knowledge absorption and are formulated as overarching *themes* and an ensuing *typology* of three different *types* of SMEs in regard to their ability to absorb new design management knowledge.

In addition, the model was revised based on the experience of the author of this thesis and the expert's opinions regarding the practical value of the model were evaluated.

5.6.3 Problems and limitations of data analysis

Although there existed rich data sets on each of the projects, there were also "black holes" of no data, episodes of the innovation processes that did not allow for direct observation. In the detailed summary tables of each of the case studies these areas are *highlighted in blue* (see Appendix A.1). They most of the time related to the work designers were doing with the companies without any (physical) involvement of the author of this thesis. We knew about most of these activities because they were later communicated to the author of this thesis by the CEO or by the designers. However, there were also examples of companies that were less transparent and withdrew for decision-making into their "inner circle". Where possible the author of this thesis points out such occurrences in the individual case studies.

Sometimes the character of cooperation between author of this thesis and SMEs would change during collaboration. At early stages, the author of this thesis worked as "facilitators who catalysed the process within the subject company" (Platts, 1993) by introducing different frameworks like the user-centred design process or tools to support the process and, through it, design management absorption. At later stages, the companies would focus more on the cooperation with designers and "use" the author of this thesis as a sounding board. This *change of role* sometimes impacted on the transparency of innovation processes.

The *messiness* of innovation processes needs to be addressed as an additional limitation of data analysis: Much turbulence could not be described in detail but was hinted at in the summary tables in the column *special observations*. Some of these observations mark turning points and are *highlighted in red*. Some others just escaped the main thread of analysis, the analysis of design management absorption.

One last remark concerns the fact that the actual "start" of design management absorption was fuzzy. While the formal cooperation between the author of this thesis and SMEs started with a first workshop during the impulse phase of the design-driven innovation process, the valuation and acquisition of design management knowledge

started often before, either through prior experiences with designers, through participating in an event of SDT or during initial talks with the author of this thesis.

Table 13 visualises possible interrelations between the DMAM and the design-driven innovation process model, without claiming that there is an exact relationship because it was out of the scope of this thesis to research when exactly and who exactly did have "first" contacts with design and design management knowledge before the actual start of the project. Nevertheless, Table 14 indicates that first steps of acquisition probably happened before the start of the action research project. Also other steps of knowledge absorption have overlaps with the single stages of the design-driven innovation process model. The socialisation phase on the other hand runs parallel to all of the activities of a design-driven innovation process.

Table 13: Interrelations between phases of the DMAM and the design driven innovation process model

5.7 Summary methodology and data collection techniques

To conduct research and to evaluate the empirical data of this thesis project a methodology from the social sciences, the *action research method* was chosen because studying absorption processes of SMEs with little or no prior design experience at the core deals with *human behaviour* (Punch, 2005), in this case with the *learning processes* of individual people and groups.

In addition, action research as opposed to e.g. case study research lends itself to researching social phenomena *in the making* such as the absorption progression of the companies involved. In this method the researcher acts as a change agent, who simultaneously observes and documents the action taking place. There is *active participation* of the ones being researched while moving through the action research cycle of *diagnosing*, *action planning*, *action taking*, *evaluating*, and *specifying learning*. The similarity of this cycle with a generic design process is striking. Actually Frayling (1993/94), in his famous distinction of research *about*, *for* and *through* design connects action research to *research through design*.

In ascending levels of analysis, the level 1 analysis will describe *how* the eight SMEs involved in this project absorbed design management knowledge; a level 2 analysis then will analyse *why* absorption processes progressed to a certain point or why projects were stopped. Throughout the analysis the *Design Management Absorption Model* will be used as an evaluation framework.

6 Results

This chapter *describes and analyses* how each of the eight companies progressed with their design management knowledge absorption and what can be learned from it with respect to barriers or enablers of knowledge absorption. The main focus of the analysis of individual case studies therefore is on: 1) the progression of design management absorption processes; 2) the reasons of success or failure of design management absorption.

This chapter also *compares* the eight company examples by 1) mapping their design management progression on an overview figure (Figure 29); and by 2) summarising the ratings of individual design management absorption progression in an overview table (Table 30). In doing so *patterns*, either *similarities* or *differences*, between companies case studies can be traced. *Evidence* throughout the single case studies and the cross-case comparison is referred to in brackets in a smaller typeface.

All of the firms' results are compared using the categories of *triggers*, *acquisition*, *assimilation*, *socialisation, transformation, exploitation, outcomes*, and the *indicators* of the Design Management Absorption Model as a reference.

6.1 Case studies

6.1.1 Case study 1 – Stiftung Schürmatt

Table 14: Company details of Stiftung Schürmatt

Name of company	Trade	Number of employees	Innovation project
Stiftung Schürmatt	Care for people with special needs	250	Development of a improved customer experience targeted at local authorities and politicians

6.1.1.1 Introduction

In the past, the Stiftung Schürmatt (Foundation Schürmatt)[67] was a children's home and many neighbouring communities still perceive it so. However, today their product portfolio is much broader including diagnostics and therapies to kindergarten and professional training, accompanied living and working opportunities. The life cycle of

[67] Here the German name of the organisation is used, an English translation by the author of this thesis is offered in brackets.

certain products such as "living" have the duration of the whole lifespan of a person with special needs, and stability and control of its resources is of the essence for this organisation.

Nevertheless, the Stiftung Schürmatt is the initiator of several innovations in the region such as a "Kooperativer Kindergarten" with facilities in the village, where disabled and not-disabled children meet, or a new project for the care of elderly people at their homes. The director and his team are aware that society is in need of Schürmatt's their social-pedagogical core technology (workshop 1) because disabilities of children and early adults become more and more complex and teachers amongst others are less and less able to cope with them. Schürmatt's core technology can be transferred to new fields.

All in all 8 workshops took place (see table summary Appendix A1), 7 of them including 4 more employees of Schürmatt besides the director, and 1 meeting between the director and the author of this thesis to analyse and discuss the development of the project in more depth (workshop 6, see table summary in Appendix A1). Two additional meetings took place to evaluate the project after its sudden stop in March 2011. During the first two workshops, there was much confusion about the purpose and goals of the project, although author of this thesis were guiding through them. Nevertheless, it was decided to engage in qualitative research with the outside support of two service designers to better understand perceptions and opinions of the key-stakeholder group – politicians and members of local authorities in charge of resource allocation – about the Schürmatt.

During a one-day co-analysis of the research data facilitated by the two service designers (workshop 5), concepts of human-centred design, the notion of empathy, and role-play re-enacting opinions, needs, and thoughts of the interviewees were introduced. After this whole-day workshop, many attendants again expressed that they were confused about the results as well as the method of analysis. At this point, the director decided to proceed without the service designers, until it got clearer what to conclude from the qualitative research data on the needs of their key-stakeholders.

To support sense making of interview results and making findings more actionable for the Schürmatt, the author of this thesis developed a cognitive map called "noise[68]". It extracted and contrasted two underlying concepts of how the key-stakeholders – and probably the surrounding community in general – have been dealing with disability; the statements reflected an ambiguous picture, old mental frames of control clashing with utopian egalitarian visions.[69]

Insights from analysis by the team (Workshop 7) were that the Schürmatt was held in high respect from most stakeholders but was also perceived as disquieting with its quest for innovation, and a bit "cool" because of their ostensibly displayed

[68] Many opinions expressed in the interviews represented stereotypes held by non-professionals; they sounded like "noise" drowning out the more subtle expressions of needs of the key-stakeholders.
[69] In the 70s, the two scholars Michel Foucault and Noam Chomsky succinctly portrayed these two frames of mind in a TV debate Also see: http://www.youtube.com/watch?v=kawGakdNoTo (retrieved Nov. 2011), Chomsky and Foucault on the nature of power (1971).

professionalism (as opposed to organisations that build on philosophies inspired by religious concepts).

An audit of Schürmatt's communication media by the author of this thesis together with a member of SDT (workshop 8) confirmed that there could be ways of presenting a social institution like the Schürmatt in a more accessible way. At the end of this workshop, however, quite unexpectedly, the director decided to end the project. There followed a personal explanation of the director why the project was abandoned and an evaluation meeting more than 6 months later with the director and one other member of the project team.

The evaluation meeting revealed tensions and dynamics inside the Schürmatt that had been perceived by the author of this thesis in form of irritations and confusions by the Schürmatt team. However, she had not been able to interpret them without the inside view, which was provided by the director during evaluations.

A table (see Appendix A.1) summarises processes, activities, etc. following the stages of the design driven innovation process model (see Chapter 4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.1.2 Analysis of design management absorption process

Triggers

The director displayed interest in the question how to "design intangible products" for his organisation (communication to author of this thesis before start of the project). So there was a motivation to engage in the project and to learn something new (Abecassis-Moedas & Mahmoud-Jouini, 2008). The director also stated on various occasions (initial talks before project; workshop 1) that the Schürmatt is a player in a specific market and has to compete for resources from regional and governmental sources to ensure long-term survival. His main interest was to explore how design could add to that.

Acquisition

The director was willing to acquire new design knowledge and acted as a gatekeeper connecting the new knowledge broker (the author of this thesis) and his team. However, even though a hypothesis to guide initial research (workshop 2) was developed it was not considered a binding *design strategy* for the other stakeholders and the organisation Schürmatt. The fondness of the CEO for the design project was interpreted as his personal interest zone by Schürmatt employees, who did not understand why they had been "dragged" into this project (minutes of first evaluation, 6 May 2011).

Assimilation

The director assigned three more persons to the research project: the head of human resources, the head of „living for adults", the head of the school for children with special needs, and the graphic designer in charge of the current corporate design, owner of a PR

agency. The team engaged in cooperation with two service designers, commissioned qualitative research and developed a research briefing for them (see photo protocols of key stakeholders and questions to ask them, workshop 3). According to our model, these activities are indicative for a more in depth *assimilation* of design knowledge, in which the ability to *brief and to cooperate* with designers is an important stepping-stone. However, the briefing did not contain specific goals about what to achieve with the research results.

Socialisation

Little socialisation of design knowledge, tools, approaches, etc. took place. During workshops, it did not become apparent that designers, author of this thesis, and social pedagogues had different notions of *creativity* and *empathy*, and that the different professional groups use creative techniques and empathy for different reasons and to achieve different goals (see special observations during workshop 1, during co-analyses workshop 5). While designers were interested in making company touch points more permeable for external key-stakeholders, social-pedagogues were directed towards the internal life of the organisation, towards safeguarding their clients and supporting them in their personal growth.

Also during the communication media audit, author of this thesis were interested in detecting patterns, strategies and the ethical stance behind representations of institutions, which deal with disabilities, sickness, taboos, etc. For designers/the author of this thesis this "visual benchmark" is a common practice as well as to "zoom out" of a given situation to gain an overview and to zoom back in on details after having assessed the situation (Conley, 2004). However, the director thought this process superficial because the author of this thesis did not have any inside knowledge of the institutions they compared (see minutes of first evaluation, 6 May 2011).

A last clash of opinions can be detected concerning, who to include into innovation projects. Part of the human-centred design mindset is a predilection for participatory processes with as many people as possible or even for co-creation with users and stakeholders. However, Schürmatt interpreted this emphasis on participation as a waste of (human and financial) resources that needed to be justified (see final evaluation interview on 29 Nov. 2011). There is no evidence of the *socialisation* of design management knowledge (as a patterned element) not only because the project was stopped, but also because the effort of the author of this thesis and the service designers was denigrated (see minutes first evaluation, 6 May 2011).

Transformation; Exploitation; Outcome:

Could not be observed.

Table 15: Analysis of design management absorption progression based on indicators Schürmatt

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence			*Final evaluation interview on 28 Nov 2011*	*Project was stopped on 10 March 2011*	*Project was stopped on 10 March 2011*
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence	*Hypothesis formulated to guide qualitative research but no binding design strategy for organisation (workshop 2)*	*Briefing leading to research but without goals concerning design project (workshop 4)*			
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points

6.1.1.3 Discussion of progression of design management absorption

In the Schürmatt case the discussion of the progression of design management absorption using the DMAM resulted in a *gap in perception* of how far the organisation had progressed. Figure 18 (overleaf) denotes in *green* the assessment of the Schürmatt team and in *red* the assessment of the author and in *light blue* the gap in perception of absorption progression of the company as compared to the author of this thesis. The legend for all the case study figures is the following:

self-assessment by company

assessment of author of this thesis (an interrupted red line will indicate an erratic form of absorption)

gap in perception of absorption progression of company and author of this thesis

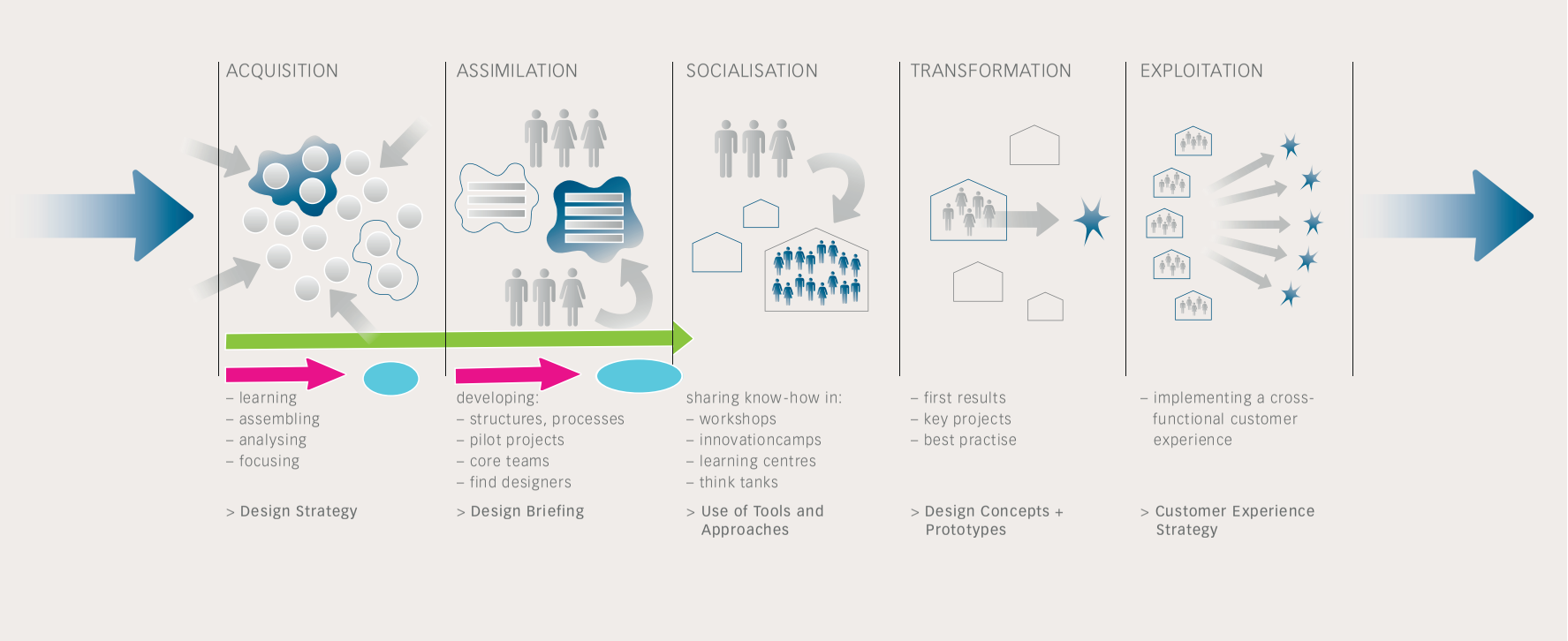

Figure 18: Progression of design management absorption Schürmatt

Green mark by Schürmatt team, red one by author of this thesis; light blue mark denotes gap in perception of absorption progression of company and author of this thesis (discussion see next page).

When mapping the progression of design management absorption, the director and the head of human resources put a dot (in green) between the acquisition and assimilation with an arrow pointing towards socialisation of design management absorption (Figure 18). According to them, the project with Lucerne School of Art and Design had been instrumental to break out of their functional organisation. The overall willingness of some employees to engage in innovation activities improved after this project.

While this might be an indicator for a more open attitude towards innovation as such, this does not necessarily mean that *design knowledge* will be used during further innovation activities. This is why the author of this thesis interprets the events around the project and the progression of design management absorption differently (marked in red and blight blue in Figure 18). Some of the basic tasks of the *acquisition phase* such as determining the added value of using design and design management in the context of an institution for disabled people were not clarified in a satisfactory way for all stakeholders. Furthermore, a clash of culture between the author of this thesis/designers and social-pedagogues made it difficult for the Schürmatt team to understand and even appreciate design knowledge.

The design management absorption process ended before it could yield any visible results. Even though there had been a *hypothesis* and a *research briefing* (see table summary in Appendix A1) as indicative for the absorption of design management capabilities during PACAP phase, the organisation was not able to realise absorptive capacity in the form of an improved customer experience for their key-stakeholders. A central role in this process played the director/gatekeeper. The longer the project carried on, the more the gatekeeper had to legitimise the use of resources (human and financial) for a project that caused more irritations than other, and therefore, finally decided to break off the cooperation.[70] His decision was supported by the fact that he had announced to retire from his position in a few months from then.

So many of the irritations at the beginning of the project can be attributed to some kind of ping pong between employees not clarifying the question with their superior but criticising the author of this thesis for learning nothing new instead, the director's omission of providing a clear explanation for the participation in the project and criticising the author of this thesis of being unclear instead. Later, this behaviour was transferred to the two service designers, who were criticised for their way of working and the outcome of their interviews, or to the author of this thesis that audited the communication media of Schürmatt.

[70] Researchers of the School for Business Administration of Lucerne University of Applied Sciences and Arts studied the dynamics of innovation processes, one of those being the dynamics of power games.

6.1.2 Case study 2 – Ledagio

Table 16: Company details Ledagio

Name of company	Trade	Number of employees	Innovation project
Zimmermann Technik AG Later: Ledagio	Electrical engineering Later: Manufacturer of LED lamps	60 (Including apprentices) Later: 6	Redesign and repositioning of an LED outdoor lamp

6.1.2.1 Introduction

At the time of the first contact with the author of this thesis in 2009, the CEO was the head of a SME (Zimmermann Technik AG) in Lucerne providing electrical engineering services and products such as energy switchboards, control devices or photovoltaic solar plants for the B2B business. Using the new possibilities of LED such as the parsimonious energy consumption, the company developed a wireless outdoor lamp for the B2C market. In addition, with the help of a communication agency a product brand (Ledagio) was designed. At that time, the communication agency also proposed the "shapes" of the lamps.

After a first tentative market launch in 2009 with mediocre results, the CEO conducted several informal talks with product designers and design scholars to get feedback for his lamp – quite a heavy and clumsy device with a product language that for the trained eye expressively told the story of silent engineering design. Furthermore, the brand as well as the website were in contrast with the product language of the outdoor lamp. So the main goal of the cooperation with the author of this thesis was the improvement and optimisation of the product together with all necessary steps to develop a consistent market positioning.

Within the research settings, four workshops took place (see table summary in Appendix A.1). During the second workshop a list of USPs or a product strategy for the lamp containing elements of ergonomics, functionality, and user scenarios, was developed as well as a definition of the target market. The new Ledagio business strategy aimed at affluent target groups, for which aesthetics and functional sophistication would matter. A design strategy pointed to the fact that more coherence of product brand and product language was needed, and that the electrical engineering company would not be the right organisation to launch and sell the product.

After initial workshops, the CEO announced to the author of this thesis that work was proceeding too slowly for him and started to cooperate with an external product design agency without involvement of the the author of this thesis. From that moment on, they were invited to sporadic feedback sessions (workshops 5 and 6) such as first concepts, second concepts, or strategy development (informal talk between author of this thesis

and CEO, 17 September 2010) but were not directly involved in product development or launch of the product any more. As one of the results of the project, in November 2010, the CEO founded a spin-off with the name of Ledagio to support his market entry into the B2C market and sold his share of Zimmermann Technik AG to members of the board.

The table summary (in Appendix A.1) lists process, activities, etc. following the stages of the design driven innovation process model (see Chapter 4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.2.2 Analysis of design management absorption process

Trigger

The *trigger* to absorb new design knowledge was twofold: 1) a new technology (LED) offering new opportunities (personal communication before project start) triggered the interest to use this technology for the development of a consumer good to diversify the portfolio of the electrical engineering company (second evaluation talk, 10 Jan. 2012); 2) the awareness that the knowledge of the consumer market including how to make products appealing to consumers was not available in the company (second evaluation talk, 10 Jan. 2012). Apart from these reasons the entrepreneurial vision and personality of the CEO were additional drivers.

Acquisition

After having found a knowledge broker (the author of this thesis) and a design agency to *acquire* information from, the CEO assembled his newly acquired knowledge into an embryonic *idea* that he needed "shapes" to win the market (e-mail 28 April 2010 of CEO). Over time, the CEO kept to this simple *product strategy* or rather conviction reducing design to form giving (first evaluation on 12 July 2011; second evaluation on 10 January 2012). A more differentiated list of potential USPs for the lamp was developed during initial workshops (workshops 1 and 2) and neglected later. Also a *partial design strategy* – to align product language and brand values –, and a *business strategy* to found a spin-off and to create a convincing environment for the B2C market (e-mail information about starting up new Ledagio, 10 Nov. 2011, first evaluation, 12 July 2011) were developed.

Assimilation

The *assimilation* of new design management knowledge did partly take place: The CEO was able to find a product design agency and to engage in product development activities. Before, a *design briefing* for the new lamp, which assembled the knowledge of the four workshops with the author of this thesis, was written (see design briefing in project documentation) but modified later by the product design agency (workshop 5), the agency went back to define different target audiences and attributes for the lamp. However, the

revised briefing was not used during concept development as conveyed by one of the designers (talk on 25 Jan. 2012).

Socialisation

The *socialisation* of new design knowledge among company members[71] was bypassed since all business transactions were transferred to a spin-off company with its own legal form, finances and new employees. Whether any other member of his new team is currently using design approaches and tools cannot be established since all contacts after workshop 4 were exclusively between the CEO and the author of this thesis. Even though the CEO developed a highly design-oriented product in cooperation with professional designers, he absorbed design management capabilities in an erratic way. During collaboration with the product designers, he did not understand their first concepts[72], instead claimed that all he needed were „shapes" (workshops 5 and 6). Later, he neglected simple rules of branding and design management such as the alignment of values throughout all customers touch points (first evaluation talk, 12 July 2011). Nevertheless, he stated to have learned that design is an iterative development process going from ideas, sketches to prototypes. He also claimed to often re-use other design tools and approaches, especially the Design-driven Innovation Model (see p. 125) to support strategic overview over the process, or the concept of 3-D-prototyping to reduce risk (second evaluation, 10 Jan 2012).

Transformation

During *transformation phase,* designers delivered first concepts and mock-ups of the new lamp. However, product development – as referred by the designers and occasionally observed by the author of this thesis – was a difficult one (workshops 5 and 6). The CEO often „trespassed" into the realm of design by proposing his own "shapes" (workshop 6). He also controlled decisions that usually pertain to the domain of product design such as the choice of materials (evaluation talk with product designer, 25 Jan 2012). Today, the product designers do not want to be mentioned in connection with the new lamp because the CEO manufactured it in low quality and with little attention to details. It can be said that there was a *prototype* as indicative of the absorption of design knowledge for this phase. However, since the designers did not consent to the prototype, absorptive capacity was only partially realised.

Exploitation

The CEO renamed his products, adjusted websites, imagery for the brochures, etc., all of which would be an indicator that he was using design management knowledge to create a *customer experience* along with the product. However, product and brand still pull into different directions and the product portfolio is an inconsistent one (evaluation 1, 12 July 2011; evaluation 2, 10 Jan 2012). In this phase, just like during product development, he consulted

[71] One representative of ZAG took part in the first three workshops.
[72] First concepts connected the form of the lamp to the new technological possibilities of LED to create ambient light without a voluminous body but through a loop emanating light.

with a variety of different brand and communication experts, a fact that resulted in an inconsistent and mediocre product branding and communication strategy.

Outcomes

Even if absorptive capacity was only partially realised, the project had an *impact* on the resource base of the former company (Zimmermann Technik AG). A spin-off was founded with its own processes, structures, and direction. In terms of strategy, the CEO further refined his *business* as well as *product strategy*. Visits to fairs in China or other countries where he found cheap products building on Western harbingers made him choose a product strategy that builds on differentiation through elaborate shapes to ward off imitation and diversification of product portfolio. Today, he names his products "lighting sculptures" and found a niche market mainly in Arabic countries. Figure 20 displays the improved lamp together with the old one allowing for a comparison[73].

Table 17: Analysis of design management absorption progression based on indicators Ledagio

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence					
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence	*List of potential product UPSs and requirements (Workshop 2) Partial design strategy on aligning brand and product; business strategy to create spin-off to market new B2C product (Workshop 1)*	*Briefing was developed, then re-defined by product designers and neglected during product development (project documentation and evaluation talk with product designer, 25 Jan. 2012)*	*CEO uses some of the tools but applies them without deeper understanding and erratically (e.g. prototyping, design driven innovation process model)*	*Decisions based on prototype on materialisation and production details without involvement of designers (evaluation talk with product designer)*	*No integral customer experience strategy developed, partial implementation (website, brochure) after talks with various external experts (1st and 2nd evaluation talks)*
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
Evidence					

[73] Via a e-mail (30 May 2012), he complains that compared to the old lamp the new one is not selling well.

6.1.2.3 Discussion of design management absorption progression

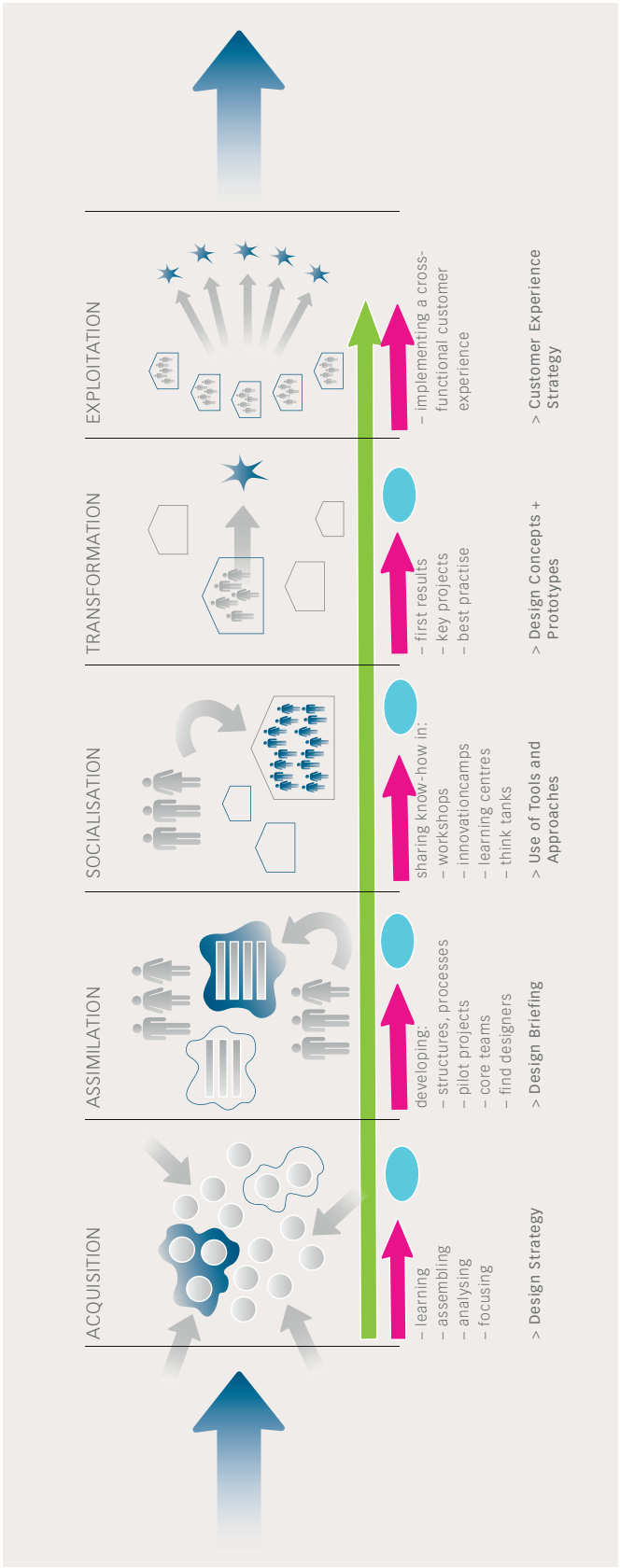

Figure 19: Design Management Absorption of Ledagio

Green mark by CEO, red mark by author of this thesis denoting an erratic form of knowledge absorption and gaps in perception of absorption progression (light blue).

In the Ledagio case, one could assume that absorptive capacity has been realised as the CEO perceived it (green arrow), since there is a new product on the market. However, the absorption of design management knowledge has been erratic and superficial (red arrows) because the CEO mainly accepted opinions that complied with his personal taste and with the financial resources he was willing to invest. After initial absorption of new design knowledge during acquisition and assimilation phases, the return to silent design during transformation phase, ironically, was a conscious decision because the CEO knew by then that designer's standards differed from his personal taste (in workshop 3 and 4 concepts of product language, etc. were introduced) causing gaps in absorption (light blue).

At the moment, he is yet again engaged in a new product development process, this time with an artist, who has a completely different approach to designing as compared to the product designers. Common design management knowledge has it that a strong brand is built with the help of a clear product language with high recognition value stretching over the whole product range. The CEO instead stated that he does not follow a brand strategy but a marketing strategy (evaluation 1, 10 July 2011). The use of multiple product strategies aims at targeting multiple market niches reducing risks.

It was not so much business necessity of the electrical engineering company driving the interest of the CEO but rather his entrepreneurial impulse. So this case shows that new product development can act as an engine of renewal leaving the company off at a very different place from where it started. Also an international market is in reach while the former electrical engineering company mainly acted regionally. However, many of these changes can be attributed to the entrepreneurial drive of the CEO and not to impulses coming from design management absorption. For him design was a means to an end and not a goal in itself[74].

6.1.3 Case Study 3 – Studer Maschinenbau

Table 18: Company details of Studer Maschinenbau

Name of company	Trade	Number of employees	Innovation project
Studer Maschinenbau AG	Manufacturer of industrial machinery	23 > 17	Reorganisation of structure, processes, workforce; search for new business opportunities connected to core technology; development of a communication strategy to push new products to the market

[74] Entrepreneurship can be understood as a process of effectuation (Sarasvathy, 2008) led by different forms of entrepreneurial expertise, one of them being the "bird-in-hand" principle: "This is the principle of means-driven (as opposed to goal-driven) action. The emphasis here is on creating something new with existing means rather than discovering new ways to achieve given goals" (p. 15). To integrate new design knowledge was a means for the CEO not a goal in itself.

6.1.3.1 Introduction

Traditionally, Studer Maschinenbau[75] focused on the cheese industry providing machinery and equipment for various processes during production. When the "cheese business" declined, the SME started also to do contract production. At that time, it employed 23 people, a third of them in contract manufacturing. When the author of this thesis met the company for the first time, the company was about to develop an innovative machine for the production of pellets out of biomass, a sustainable energy source. A new CEO had taken over from the founder-inventor and outsourced all activities concerning this specific innovation to a spin-off to minimise risk.

In 2009, the author of this thesis cooperated with the new CEO and the founder-inventor and introduced design and design management in a previous research project (Acklin, 2011a). Back then, the CEO accepted to cooperate with an industrial designer on the pellet machine and made his first experiences using design and design management in product and service development as well as in communication, branding and business modelling.

The 2008 financial crisis, however, hit Studer Maschinenbau hard. The CEO recognised that the company had to commercialise and exploit one core technology instead of inventing more and more. Studer Maschinenbau decided to rigorously weed out its product portfolio and to focus on the most promising technology the founder had invented, the water-jet technology. In late 2009, the company developed a machine, which is able to accurately cut off the crust from the cheese before packaging without loosing material. This machine (see Figure 20) was the first one to leave the

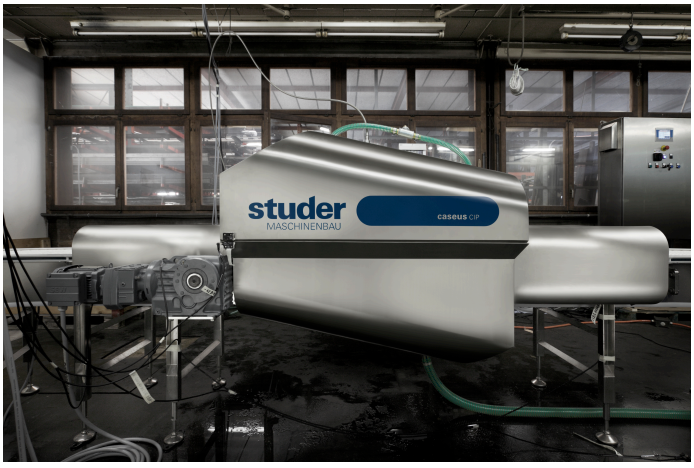

Figure 20: Caseus CIP, first generation (2010)

manufacturing hall after having gone through an interdisciplinary development process of engineering and design[76].

[75] In English, the name would translate into Studer Machine Building Corporation.
[76] Since it was for the American market and had to comply with FDA regulations, the machine was well thought through. It was also the first time the company experienced exporting to non-German-speaking countries.

The case of Studer Maschinenbau is an interesting one because of two reasons: Firstly, it is the only company in the sample of this action research project that – since 2009 – cooperated with an external industrial designer on its products. The CEO was not a total beginner in the use of design and design management and had developed the machine Caseus CIP I (Figure 20) based on the knowledge he had acquired before, and on a trusted relationship with the external industrial designer. Secondly, the company was in the midst of a transformation because of the financial crisis right before it decided to join this action research project. The CEO wanted to further develop the new machine and find new fields of application for the water-jet technology.

First workshops led to the definition of the "hunting ground" for new fields of application. During brainstorming sessions, the potential benefits of the water-jet technology for industry sectors such as food, animal feed, cleaning, recycling, etc. were explored putting user needs at the centre of attention (e.g. hygiene and the hygienic operation of machinery is of utmost importance in the food area). Criteria for the selection of ideas from the brainstorming sessions included economic, technological as well as user-centric ones. Also the formulation of a list of USPs of the water-jet technology to convince business partners was done from a future customer's perspective.

During collaboration, it also became evident that due to the transformation process of the company, the organisational structure had to be adjusted. So another focal point of the project was the work on the innovation organisation. When at the end of 2011, the demand for contract production broke down the CEO had to let a group of employees go. The organisation was ready to take the blow because it had established new strategies, structures and processes in time. Overall 8 workshops took place, accompanied by a series of e-mail feedbacks and phone conversations.

The table summary (see Appendix A.1) lists process, activities, etc. following the stages of the design driven innovation process model (see Chapter 4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.3.2 Analysis of design management absorption process

Triggers

The main trigger for design knowledge absorption was the fierce competition due to the financial crises in 2008 and 2011, and the decline of the company's traditional „cheese business". This project was not a hypothetical strategic exercise of an idle CEO but an existential necessity to survive on the market[77]. With it came the necessity to position Studer Maschinenbau as a technology leader through all touch points and communication channels with the goal to export to international markets (workshop 6). To become a technological leader touched on the way the company organised its innovation business

[77] The cooperation started in fall 2010, in late fall 2011 the CEO had to lay off the group in charge of contract manufacturing. The company shrunk to 17 people.

(development of new machines) and its operational business (contract manufacturing). Analysis made evident that the organisation was out of balance with the operational business taking up too much time (workshop 1).

Acquisition

Since the company had already *acquired* central design and design management concepts and started to use design strategically in a prior project, a deepened or accelerated form of design management absorption could be observed. Instead of developing a *design strategy* for further machines, *design approaches* were used to *drive strategy* and business development (workshops 1, 2; later workshops 5). To use design approaches e.g. to focus on future customer needs to "mold" business strategy was a successful one; it also proofed to be an "investment" in the later development of a brand, communication and customer experience strategy.

Assimilation

During *assimilation phase* the CEO absorbed design management knowledge on how to create an innovation organisation (workshops 4, 5) capable of continuously innovating and upholding operational business at the same time. Studer Maschinenbau, over the duration of a few months, adapted processes and structures (the change of organisational form, selection of employees based on strategic direction, processes, ect.) to fit strategy (CEO reported developments at beginning of each workshop). The designer formally became a permanent member of the innovation team. Later in the project, a *design briefing* was developed for a photographer to rework key-visuals and communication and marketing media (workshops 6 and 7).

Socialisation

Over the last years, the change of the company's strategy had become evident in products, improved functionality, ergonomics, product language, etc. Employees by now accepted design as part of product development and were proud of their machines. Still, to drive change internally had been difficult. During workshop 4 on the innovation organisation, the CEO described his employees as unwilling to take on responsibility (workshop 4). Employees, more actively, bought into the new direction of the company, when products started to be successful on the market. Although formal training to *socialise design knowledge* did not exist, the CEO used visualisation techniques such as posters or storytelling to explain the new direction to his employees (evaluation, 18 Jan. 2012). When contract manufacturing had to be foreclosed, the CEO dealt with this situation by – again – using design interventions: All the offices and the construction hall were refurbished and renovated (evaluation, 18 Jan. 2012). He was convinced that this would boost the motivation of the remaining employees and even improve quality because in a newly designed environment they would have to handle things with more care.

Transformation

In this project, the focus was not so much on products. Nevertheless, the ongoing process of improvement of the Caseus CIP 1 machine during the project led to a second generation of the product, to more value creation inside the company (e.g. the in-house production of a unique conveyor belt), and to the reduction of production cost (several reports of CEO at beginning of workshops). The main focus of this project, however, was on adapting corporate design, branding and communication media, and the overall image the company was projecting of itself. The company now has a look that supports the company's aspiration to export to international markets (new images and brochure in project documentation). So absorptive capacity has been realised during *transformation* phase.

Exploitation

During workshop 6, a *customer experience strategy* was developed. To *exploit* design at all touch point, however, was difficult due to lack of time and financial resources. During evaluation (18 Jan. 2012), the CEO stated that the company is still lagging behind implementing some of the *customer experience strategy*. To express excellence and technological leadership at all touch points is highly demanding of a small company, he stated, and necessitates a permanent control even of the smallest details such as whether employees are really wearing their corporate clothes at all times or not. This went beyond time resources of the CEO (evaluation, 18 Jan. 2012).

Outcomes

Design knowledge absorption impacted on the (on-going) improvement of the product, the manufacturing processes and the overall customer experience. The project also strongly impacted on other company resources such as a new organisational form. Design was included as a permanent function into the innovation processes of the company. Today, the industrial designer has also taken over some design management tasks by suggesting and advising the CEO on corporate design issues such as the use of key visuals (evaluation, 18 Jan. 2012).

Table 19: Analysis of design management absorption progression based on indicators Studer Maschinenbau

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence					
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence					*Integral CX strategy exists, not yet fully implemented*
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
	Clear understanding on how design "fits" in; design approaches such as human-centred design driving business strategy (Workshops 1, 2, 3)	*Implicit briefings during on-going re-design of machine; briefing for re-design corporate communication and brand developed (Workshops 5, 6,7)*	*Design approaches such as human-centred design driving business strategy; tools such as visualisation used to drive change, customer journey re-used as guiding instrument (evaluation 18. Jan. 2012)*	*Increased understanding of e.g. use of visuals to communicate value to customers; in-depth understanding of interdependency of product functionality and product language (workshop 8, evaluation 18. Jan. 2012)*	*Integral CX strategy exists, committed to fully implement it (evaluation, 18. Jan. 2012)*

6.1.3.3 Discussion of progression of design management absorption

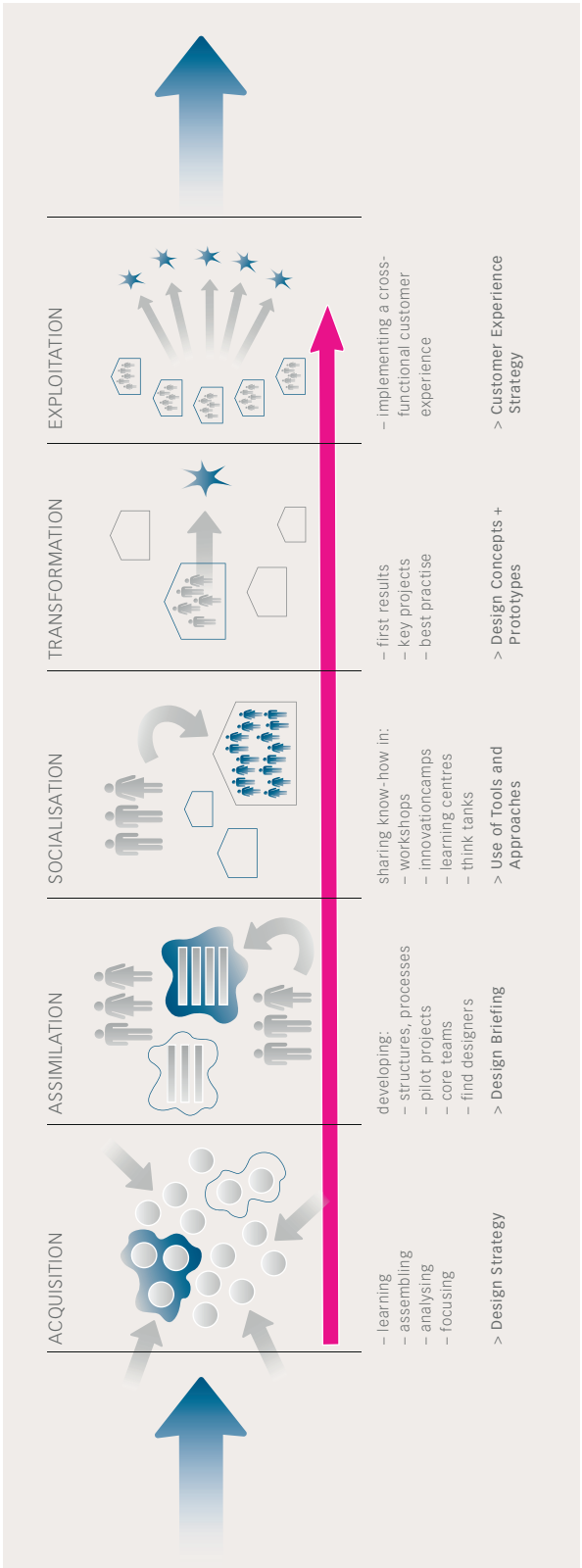

Figure 21: Progression of design management absorption Studer Maschinenbau

In this case, both the CEO and the author of this thesis agreed on the progression of knowledge absorption.

The company went through all the stages of acquisition, assimilation, socialisation, transformation and exploitation, and *realised absorptive capacity*. Since the company was already using design and design management, absorption of a higher order took place. In this case, design leadership capabilities – meaning the strategic use of human-centred design principles – were used right from the start. However, design leadership and business development skills overlapped to an extent that the two notions blurred into each other.

The early formulation of user needs and benefits of using the water-jet technology laid the groundwork for the formulation of the innovation strategy as well as for the communication media (brochure, website, film trailers), branding and corporate design, which were developed later. This alignment was considered a necessary step to close the gap between the image of a SME with a formerly regional focus and its aspired position as a leader in the water-jet technology on the international market. During evaluation, the CEO stated that there is a feedback between the product (and product language) and the environment (tangible and intangible), in which it is presented. Several experiences with customers made it clear that trust in the product and the propensity to buy it is also built on the right accompanying materials such as brochures, websites, handbooks, and after sales services.

Work on the innovation organisation led to a new optimised organisational structure, in which the "right" people were being put into the "right" position to become an "ambidextrous organisation" (Tushman & O'Reilly, 1996). The external industrial designer was included into the organisational chart as a permanent member of the innovation team, even though the company did not directly employ him[78].

Danneels (2002) maintains that new product development is an *engine of renewal* for a company. In this case, it can be said that the design-driven fuzzy frontend research and the development of new business opportunities together with the ongoing adaptation of the core technology and its applications in the form of new machines *acted as a dynamic capability*. The CEO de-coupled, re-coupled, cut or acquired company resources and designed a new organisational form (evolutionary fitness) to fit the new market situation (technological fit). In the process, he recurrently also used new design routines such as imagery, storytelling, and visualisation as a tool for sense making, or the design of the environment to actively strengthen the new company culture and innovation capability. The CEO stated that he would not be able to measure the impact of design in monetary terms. Nevertheless, he is convinced that design principles and approaches drive the innovation capability of the firm.

[78] He now supports the CEO also in matters of visual communication and environmental design and nearly fills in the position of a design manager.

6.1.4 Case Study 4 – Tofwerk

Table 20: Company details Tofwerk

Name of company	Trade	Number of employees	Innovation project
Tofwerk	Manufacturer of mass spectrometers	27	Development of a branding strategy for a high-tech OEM product (and market)

6.1.4.1 Introduction

In 2002, two former university researchers, physicists, founded Tofwerk to commercialise a highly specialised measurement technology, the so-called time-of-flight mass spectrometry. Today, most of Tofwerk's 27 employees are scientists with backgrounds in physics, chemistry, electrical engineering, etc. Mass spectrometers (MS) are able to analyse the chemical composition of solid, liquid, gaseous and plasma samples with high velocity and precision. They consist of several modules such as an ion source, a box with a vacuum inside, a pump to induce the vacuum, etc. held together in varying configurations. Some MS are called "time-of-flight" (TOF) because they identify molecules by measuring the time it takes them to fly across a fixed distance in a vacuum. 20% of Tofwerk's products are one of a kind ordered by research centres around the world.

Some time ago, Tofwerk started to cooperate with several original equipment manufacturers (OEM), which include Tofwerk's MS into even bigger configurations of modules including i.e. gas chromatographs. With one of these OEM customers Tofwerk would have been able to sell more than single bespoke MS, to expand its production to 10 or 20 pieces with the same configuration of modules, and to reach a group of similar end users. OEM usually doesn't allow any co-branding but in this case the customer agreed to it.

When the CEO-physicist approached the author of this thesis, Tofwerk had already made some experience with an external industrial designer. The CEO had heard that industrial designers should early on be integrated into product development and the designer proposed a first concept for a container (Figure 22). The container looked "beautiful", the CEO wrote, but had not added to the usability of the product nor had it helped to reduce production cost. The project was put on hold because the engineers were still working on the basic functionality of the GCGCTOF and the relationship with the original equipment manufacturer (OEM) customer did not move forward how the CEO expected.

Figure 22: First concepts of container for GCGCTOF by external industrial designer

During cooperation, a rather open discussion took place around the question, where design fits in with a high-tech and research-driven SME with a business model that mainly focuses on delivering products to OEM (contents of workshops see table summary in Appendix A.1). During the project, nothing "concrete" was implemented.

However, when half a year later, the author of this thesis got in touch with the CEO for an evaluation interview, he sent a picture of the next generation MS, the FASTOF with a red aluminium shield covering a control module with lots of cables and plugs hidden inside leaving the heart of the machine open for users to work on the ion source at the top (Figure 24). One of the engineers had developed a for Tofwerk acceptable form of product branding. The table summary (see Appendix A.1 lists process, activities, etc. following the stages of the design driven innovation process model (see Chapter4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.4.2 Analysis of design management absorption process

Triggers

A standard configuration, the GCGCTOF, was about to become Tofwerk's first end user product, meaning that there seemed to be the opportunity to sell 10 – 20 MS to the same OEM customer and for the same target group. In this context a professional and consistent product or technology branding and partly also industrial design focusing on the usability and serviceability of the product started to make sense for the company (workshop 1). Furthermore, there was some curiosity how to use design properly during product development and how it could add value to such a high-tech product.

Acquisition

There has been an *acquisition* of design knowledge through cooperation with an industrial designer leading to *first concepts* for the container before project start (e-mail communication of CEO before project start, Dec. 2010). These concepts were shelved; the first trial to adopt design did not lead to any visible outcome. During cooperation with the author of this thesis, the many discussions about the rational of using design on bespoke high-tech products led to more *awareness* of design's potential and limitations (evaluation, 7 Feb. 2012). Although the CEO *acquired* new design knowledge in the attempt to understand where design fits it, no formal *design strategy* was established (workshops 1, 2). Instead a list of questions and requirements was developed, in case Tofwerk would have been able to brand their products in the future (written document, outcome of workshop 1 and 2).

Assimilation

Design knowledge was *assimilated* through the attempt to include the external designer also a second time. During a previous cooperation on the container, the external designer himself developed a *design briefing* questioning the CEO about brand values, etc. A second *briefing* was the result of the cooperation with the author of this thesis (workshop 4), which included the agreement that a future container should be guided by specific design criteria such as the use of a transparent material to show the „heart" of the MS; tidying up the machine by bringing cables, screws, plugs, etc. aesthetically more into line; developing a control panel, which is easy-to-use and to understand, etc. This second briefing was not put to work since the project was again put on hold.

Socialisation

During evaluation (7 Feb. 2012), the CEO of Tofwerk stated that all company members accepted design by now but that it still was hard to actually implement design measures[79]. This statement can be verified since design knowledge has partly been *socialised* as engineers started to implement some of the requirements on the construction of the MS defined during *assimilation* phase. Besides altering the construction to facilitate serviceability and to reduce complexity, one engineer developed his own solution for a shield. Whether this shield is an indication of the intentionally repeated use of design tools and approaches is questionable. It rather seems to have happened at the spur of the moment (see also the next point 5.).

Transformation

Even if unintentionally some foray into the phase of *transformation* has been made with the shield. The CEO stated that it had just been an experiment by one of the engineers but he also felt that it fit the requirements of ease of use and serviceability and was a valuable attempt at branding their product (evaluation, 7 Feb. 2012). The logo of Tofwerk had

[79] As mentioned in Chapter 2.2.1 the downside of an adhocracy is the necessity for extensive communication amongst team members.

not been applied to the shield so far and the colour chosen was not the corporate one[80] but the shield still seemed a surprising step towards a solution. There now exists a *prototype* of the container/shield, which is a hybrid between professional and engineering design.

Exploitation

A *customer experience strategy* was developed but none of the measures were implemented.

Outcomes

No obvious impact on company resources could be observed. However, there is a latent one. In case Tofwerk finds another OEM, which allows product (co-)branding, then the house-made shield solution might be implemented.

Table 21: Analysis of design management absorption progression based on indicators Tofwerk

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence	*Design is received with ambivalence*		*The engineer might have acted at the spur of the moment.*	*Prototype of shield developed by engineer (not designer)*	*CX strategy developed but not implemented*
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence	*Potential of design recognised; list of questions and requirements developed after workshops 1, 2*	*Sketchy re-briefing for container project between designer, company and the author of this thesis (result of workshop 4)*	*Construction of MS partly based on design criteria such as reduction of complexity, serviceability.*	*Shield developed by engineer but incorporating some of design criteria*	
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
Evidence					

[80] This is a doubly unfortunate choice because during workshops the example of Pfeiffer vacuum pumps was used as a best practice example of product and technology branding in the OEM business. Pfeiffer consistently uses red in their product branding.

6.1.4.3 Discussion of progression of design management absorption

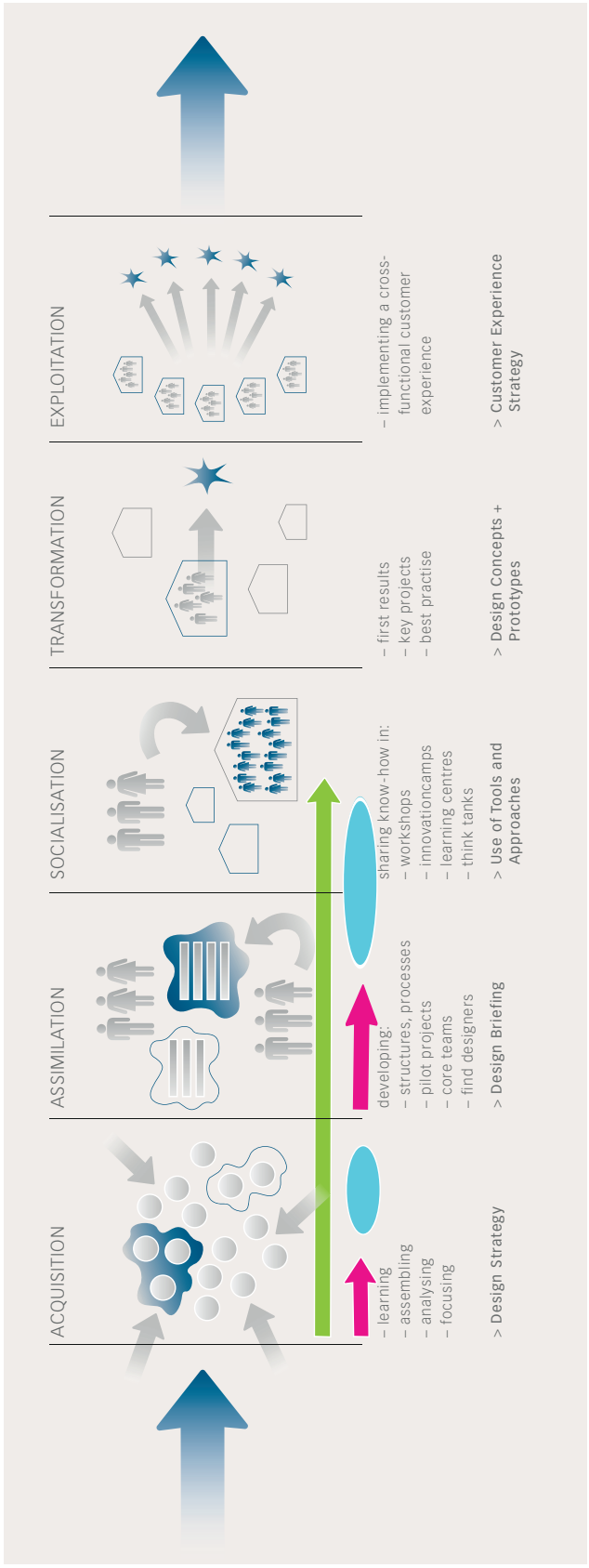

Figure 23: Progression of design management absorption Tofwerk

During evaluation (7 Feb 2012), the CEO points out that design has been socialised in the company (green arrow); the author of this thesis (red arrows) can only partly confirm socialisation because it is not completely clear as to whether the engineer actively put design criteria into practice, when designing the shield or just acted at the spur of the moment – leaving a gap in perception of the CEO and the author of this thesis (light blue).

The design management absorption process of Tofwerk was characterised by the repeated stop and go of the development of the container/shield, and by the recurring question what exactly would be the added value of design for the company and its products. Another recurring pattern during this project was that the author of this thesis, the CEO and the occasional Tofwerk employee would stand around the "machine" trying to understand the complexity of the configuration of modules that make up a MS and to use design thinking in the most basic sense of the word[81].

Many of these discussions seemed purely hypothetical and the author of this thesis were of the impression that Tofwerk was pondering different options but not really interested in realising them (Workshops 1, 2, 3). In addition, before the work on the container was finished the relationship with the OEM customer turned sour and the second attempt to conceive of a container was put on hold. Even if there would have been a *design strategy,* an indicator of design management absorption during the acquisition phase, it could not have been easily connected to business strategy because OEM usually do not allow co-branding. So it can be said that design (not necessarily design management as the capability to choose appropriate design solutions) has limitations in this specific high-tech environment.

Furthermore, Tofwerk is the exact embodiment of an innovative organisation or an *adhocracy* as described by Mintzberg (1996). Adhocracies have highly organic structures, little formalisation of behaviour, specialised jobs based on experts, or a tendency to deploy experts in small project teams to do their work (see also Chapter 2.2.1). In adhocracies strategy is highly emerging, fluctuating or plain unclear. So the CEO is not so much a chief executive at the top of an organisational pyramid but the intermediary between the market and the teams trying to make sure that there is a continuous flow of demand and work. Mintzberg (1996) calls the innovative organisation the most democratic and less bureaucratic configuration.

At Tofwerk, experts with a high competence in their respective discipline work jointly on complex technological questions and develop the technology further with each new bespoke product. To socialise design knowledge in this context is a difficult undertaking. There is little time and effort put into the commercialisation of the technology, into the standardisation of modules and interfaces, or into scaling the production beyond more than one product (see also evaluation, 7 Feb. 2012). Design, however, unfolds its strengths mainly within an economy of scale, as small as it might be.

It was mainly the CEO who developed different design management capabilities such as a proper understanding of design as a human-centred activity adding a user perspective to the product. In retrospect, the CEO is convinced that it was a mistake to introduce the designer into the product development process at an early stage. The (interdisciplinary) complexity to develop a new and better MS for each client is enormous and Tofwerk's team is completely intent upon delivering the required functionality. Yet

[81] thinking about the product through the lens of design

it was understood that product language and branding need to be aligned with company values. During the first workshop (11 Feb. 2011), the team gave the first container concept the nickname "Ferrari". The Tofwerk team instead compared its product to a German car, less flashy and more precise. This little anecdote makes evident that a connection between the designer's strategy to brand the MS like a product for the consumer market (e.g. the designer states to have taken his inspiration from Casio watches) and Tofwerk's business model was missing.

Even though not yet completely thought through the CEO and one of his engineers found their own solution, which is surprisingly simple. Users, in this case, scientists in laboratories around the world need to daily access the machine to perform services; that's why the heart of the machine is accessible allowing a view on the core technology. A shield, which acts as a subtle form of product branding and which can be taken off easily, hides the "untidy" parts. An informed way of engineering design – in this case – is the better solution than an overly designed one. On the other hand, the shield is an ambiguous result, since it is partly based on formulated design criteria, partly on the taste of the engineer.

Tofwerk has absorbed design knowledge but this resource will lie dormant until a product branding strategy will become possible with another OEM.

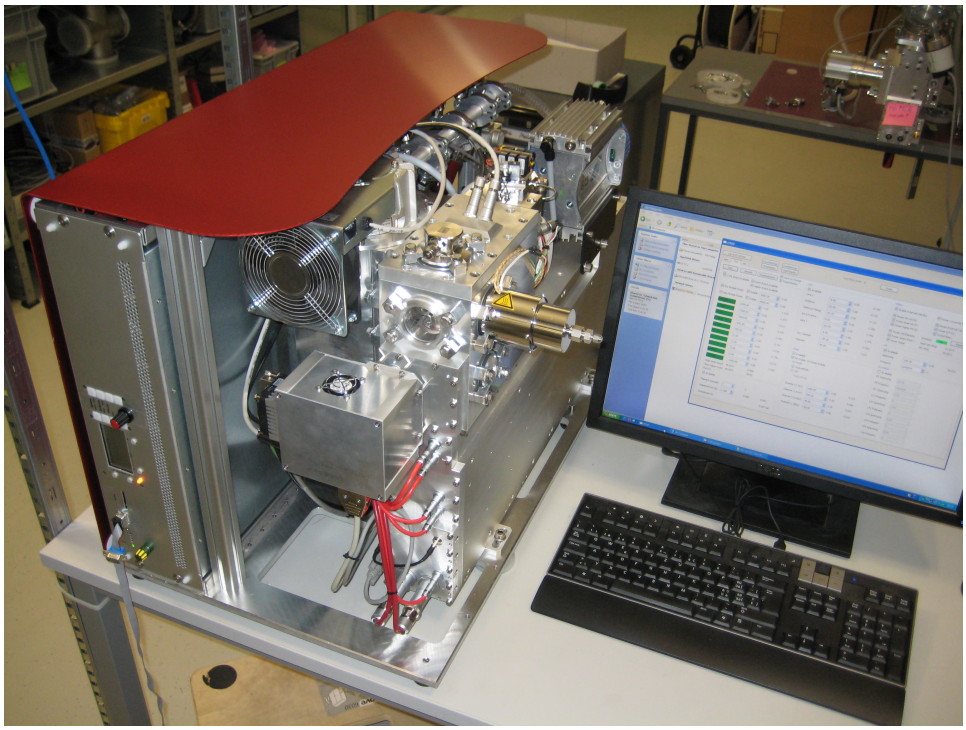

Figure 24: FASTOF, second generation with prototype of red shield

6.1.5 Case Study 5 – Schreinerei Bieri

Table 22: Company details Schreinerei Bieri

Name of company	Trade	Number of employees	Innovation project
Schreinerei Bieri	Carpenter's shop (Mainly manufacturing kitchens)	20 (Including 5 apprentices)	Development of a carrying case that can unfold into a small working space for the use on construction sites with no infrastructure

6.1.5.1 Introduction

The owner of a carpenter's shop had made the observation that construction sites lack the infrastructure to hold meetings amongst painters, electricians, project managers, architects, foremen, etc. Constructions sites are dirty and wet and the many professionals arrive there with some kind of bag or briefcase containing building plans, which they cannot spread anywhere to have a proper discussion. The CEO of the carpenter's shop developed the idea for a new product, a hybrid between carrying case, tray and table, which can be unfolded on the spot and serve as a small working space.

At the time of the first meetings with the author of this thesis (July 2010), a rough briefing already existed together with a sketch of how the product should look like. What was missing was a clear idea for an opening-unfolding-standing mechanism that would turn the carrying case into a table with a firm stand on uneven floors. The author of this thesis suggested hiring an industrial designer to develop the product functionally and aesthetically, and introduced different design agencies to the carpenter/CEO to choose from. The CEO decided on two product designers with a strong manufacturing background and – after a second preparatory meeting to check on possible funding schemes from the government – joined the action research project.

It was unclear as to whether Schreinerei Bieri itself would manufacture the new product because the company did have little experience with manufacturing anything other than wooden products. At the beginning, the intention was not set on creating a new company but rather to explore the feasibility to actually manufacture the product. His sister, however, a partner in the entire project, was toying with the idea to market the result herself[82].

After an initial meeting in July 2010, the search for a design agency (Sept. 2010), and a preparatory meeting (Oct. 2010), three more workshops and several informal talks took place (see table summary in Appendix A.1). In November 2010 (workshop 2), a big introductory workshop with eight people participating aimed at understanding the problem and the user needs, at comparing already existing products from different categories, and at brainstorming on possible solutions. After this, the designers were

[82] The working title of the product was „easy boy".

commissioned to come up with a solution for the opening-unfolding-standing mechanism.

The CEO and his sister stopped the cooperation with the designers after the third workshop (Feb. 2011), during which functional prototypes were presented. They were not convinced that the designer's work was leading to a solution fast enough and decided to develop the mechanism together with some friends. When this attempt did not yield any results either, the brother and sister decided to look for a manufacturer who would provide them with a ready-made solution. After another workshop on the business model for a spin-off (March 2011) and after having found a prototyping company (with an engineering background), the CEO/sister dropped out of the action research project.

Presently, the CEO/sister are trying to raise governmental money to invest into product development. The prototyping company simplified the solution using an already existing carrying case and attaching legs to it that can be folded up during transportation. The CEO/sister accepted this concept because production cost would go down considerably, even though it did not comply with the original briefing (evaluation talk, March 2012).

The table summary in Appendix A.1 lists process, activities, etc. following the stages of the design driven innovation process model (see Chapter 4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.5.2 Analysis of design management absorption process

Triggers

The main trigger for the project was the detection of an unmet user need by the CEO combined with a sense of entrepreneurship and curiosity whether he would be able to develop and commercialise his invention. He also hoped to reduce business risk through diversification of the product portfolio (evaluation interview, 2 March 2012)[83]. It was unclear, however, whether his existing company would manufacture and market the product, or whether a new company would have to be founded.

Acquisition

Before project start (July 2010), the CEO and his sister could be convinced that industrial designers would be the right professional group to develop a opening-unfolding-standing mechanism as well as the overall functionality and the look of the product. At the start of project, the product was centre stage and the development of a business or design strategy was postponed to the moment, when a prototype would proof the feasibility of the project. A *product strategy* emerged during the second and was concretised during the third workshop (workshops 2, 3). The questions of the market price and the business model

[83] During the action research project, the carpenter's shop did extremely well because of a lot of activity in the real estate sector.

to distribute the product kept coming up but were not discussed properly. So acquisition did *not* result *in a design strategy* as part of the business strategy. (A sketchy outline of a business model was developed taking a user-centred design approach in workshop 4, March 2011.)

Assimilation

The CEO built a temporary project team including his sister and his wife but nobody else from his carpenter's shop. The sketch of a design briefing existed already before the selection of a product designer (workshop 1). This initial *design briefing* got clearer through several talks with the designers and the workshops 2 and 3 mentioned above. Also during workshop 3, two future customer personas were developed to complement the initial design briefing. However, as stated before, other market information such as envisioned price, number of pieces, or future distribution channels was missing at this stage. The missing business strategy weakened the "enhanced" design briefing.

Socialisation

The CEO readily absorbed a user-driven approach because craftsmen are practical and user-driven in the development of their solutions. One could argue that both – designers and craftsmen – share a sense of making and usability of pre-modern professions (Jahnke, 2009). The designers, however, approached product development in a holistic manner trying to integrate all aspects from functionality, structure of product, materialisation, user's needs, future production cost or market segmentation right from the start (designer's introductory presentation for workshop 2). Conversely, the CEO/carpenter thought that there was too much fuss made about it and just wanted to see a feasible technical solution first (workshops 2 and 3). During collaboration with the designers, the latent doubt persisted in him whether industrial designers would be capable to develop the mechanism (statement of CEO after workshop 3). So there is no indication of socialisation of design knowledge (see also next paragraph 5. Transformation).

Transformation

Even though there is an indication of a partly assimilation of design knowledge (enhanced version of a design briefing) and *first not yet fully functional prototypes* were presented (workshop 3), the CEO and his sister decided to stop the collaboration with the designers because development took too long. Brother and sister decided to work on it on their own and/or with friends. They were afraid that otherwise costs would soar. However, their attempt was unsuccessful as well and the CEO and his sister decided to hand over product development to an engineering/prototyping company. Since the collaboration with the author of this thesis as well as the designers was interrupted a proper assessment of the transformation phase cannot be done[84].

[84] The author of this thesis was presented with a second functional prototype of the engineering company that was much simpler and did not comply with the first briefing (evaluation interview, March 2012).

Exploitation

Did not take place.

Outcomes

There are no outcomes of design management absorption.

Table 23: Analysis of design management absorption progression based on indicators Schreinerei Bieri

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence	*No business strategy to support design strategy after workshop 2*		*Company turns to engineers to finalise product idea*		*Project was stopped*
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence	*Development of product strategy including target groups in workshops 3; initial steps towards a business model in workshop 4*	*Enhanced design briefing after workshop 2; business dimensions missing*		*No fully functional prototypes lead to decision to interrupt cooperation with designers after workshop 3*	
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
Evidence					

6.1.5.3 Discussion of progression of design management absorption

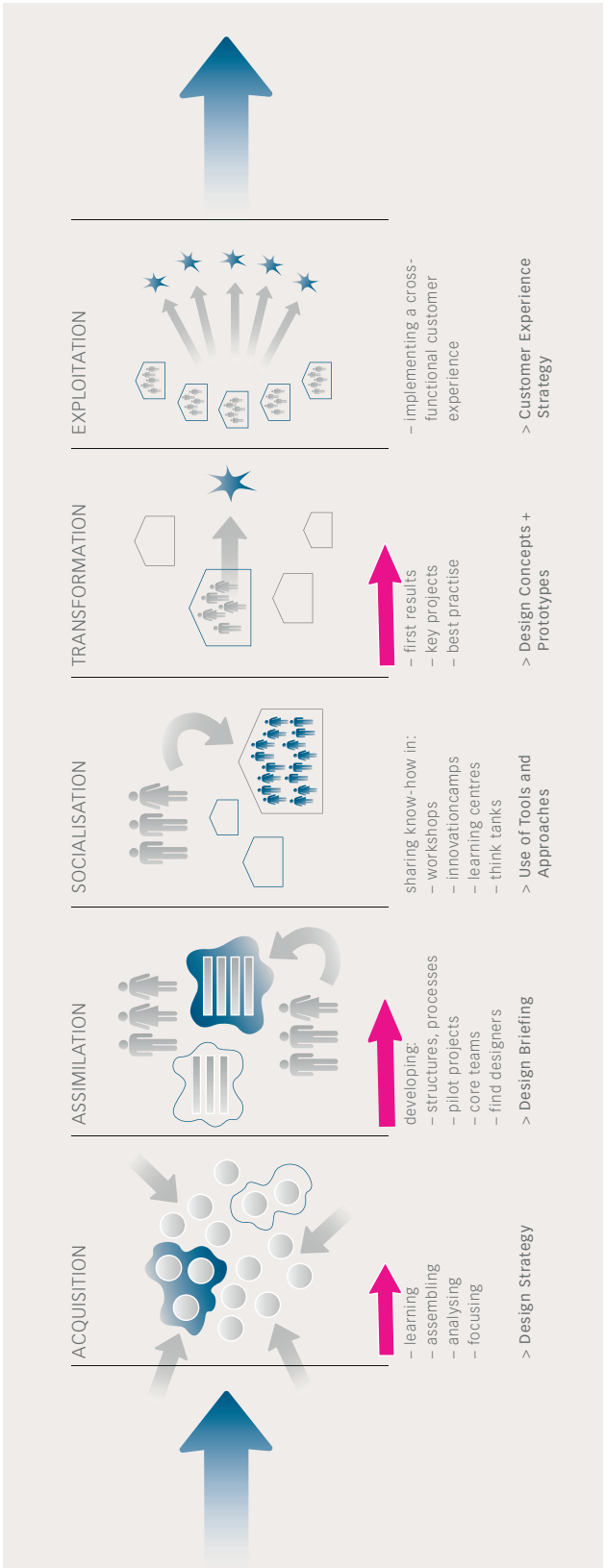

Figure 25: Progression of design management absorption of Schreinerei Bieri

Because of time constraints during evaluation interview on 2 March 2012, the Bieri family did not assess their own progression of design management absorption. The red arrows display the analysis of the author of this thesis.

The progression of design management absorption is mapped through small interrupted arrows during *acquisition*, *assimilation* and the beginning of *transformation* phase (Figure 25). Design management knowledge has *only partially been absorbed* during the first three steps of design management absorption because of a number of different reasons. 1) The CEO and his sister were disappointed with the results of the designers, when they did not present them with a convincing technical solution and broke off collaboration (after workshop 3). 2) The CEO and his sister did not want to invest more money into an endeavour with an uncertain outcome (decisions after workshops 2 and 3). 3) There was an unspoken competition between the craftsman/CEO and the designers using craftsmen's skills when building functional prototypes. Nevertheless, the brother and sister maintain to have understood that design can act as a driver of innovation (evaluation, 2 March 2012).

During evaluation interview (2 March 2012), the CEO stated that he could have shown designers how to build a proper prototype and that cooperation with them should have been more intense to control what they do. His statement echoes the opinion of many artisans that designers are good at styling but not at building things. Designers on the other hand did not feel respected in their efforts to come up with a solution because they were not given enough time and resources (e-mail to author of this thesis in June 2011). They maintain to have found the opening-unfolding-standing mechanism after discussion of the first functional prototypes (Feb. 2011) but were taken by surprise by the decision of the brother-sister team to stop the work.

Abstracting the results of this project, it can be said that there was an entrepreneurial impulse of the CEO to create something new but that there was no life-threatening situation to his current business to really set his mind on creating a new one. This might have influenced how much money the CEO/sister were willing to invest, which again limited the amount of time at the disposal of the designers to develop a technical solution. Many SMEs have limited resources to invest into innovation and, thus, often are described as risk averse (Cox, 2005). In this case, the lack of an entrepreneurial vision seems to have affected that little bit more of effort and investment necessary to "go the whole way" and to aim for a clever and attractive new product instead of an inept one. The ironic twist about the new product strategy developed by the prototyping company is that the CEO/sister, sooner or later, will again have to cooperate with designers to turn the simplified prototype into a marketable product.

6.1.6 Case Study 6 – Sistag

6.1.6.1 Introduction

Table 24: Company details Sistag

Name of company	Trade	Number of employees	Innovation project
Sistag AG	Manufacturer of industry valves	138	Redesign of brand architecture and communication media including development of a service organisation

Sistag, a company located near Lucerne, is a manufacturer of industry valves and gates, which control water and other movable materials, prevent floods, etc. Although the company employs only 138 people overall, the company serves an international market through sales representatives, and runs a subsidiary in Germany as well as in the USA. Some 60 years ago, the Swiss engineer Joseph Wey developed the valve Sistag sells today, a high quality valve that closes tightly and if necessary also quickly. Sistag is since its origin in 1908 family owned, but nowadays – with the exception of the CEO – is run by a non-family management team.

The company battles with one of the typical problems of the Swiss economy[85]: Most companies manufacture with the highest quality standards. However, with high production and labour costs, and a strong Swiss franc companies are doing a balancing act on a tight rope at this point in time. They want to keep their quality standards up, and thus have to sell at a hefty price. In this situation good communication skills and convincing arguments are a business imperative. In the past, Sistag noticed that their sales representatives were invited to many bids but often failed to get acceptance because of the inability to convince the customer to buy their products at a price premium (workshop 1, March 2010).

At the beginning of the collaboration with the author of this thesis, the company had not yet decided about the direction of the cooperation project. The team consisting of the CEO, the COO and the head of marketing was interested in strategic questions such as how to move into new fields of application for their technology; or how to position the company as a "problem solver" of complex situations in areas such as mining, biogas, sludge, etc. apart from "keeping a handle on water" (citation from their website[86]). During the first workshop (March 2010), it also became apparent that the company did not have a clear understanding of their market positioning.

[85] This problem has grown even more acute with the Euro being down and the concurrent revaluation of the Swiss Franc.
[86] http://www.sistag.ch/ (accessed May 2012)

Another problem area was inconsistencies in their brand architecture. The trademark "Wey" had grown into a product brand more popular than the company brand Sistag; the latter was known in Switzerland but was not equally established outside the country. The team was considering pushing the Wey instead of the Sistag brand (workshop 1, March 2010). As mentioned before, communication by sales representatives was a weak point connected with the fact that outside of Switzerland services were not as speedily offered to customers as on their home market. One of the problems of the firm at the time was one of alignment of brand and strategy or the lack of design management capabilities in that area.

Overall, 12 workshops took place between the author of this thesis and the CEO, the COO and the head of marketing (see table summary in Appendix A.1). During workshops 2 and 3 (26 March, 6 April 2010), an innovation hypothesis was developed, which also could be called a *design strategy* since it focused on problem areas such as the questions on brand architecture and corporate identity, to which design would be able to make a contribution and not so much on innovating their products.

As can be seen on Table 30, almost all of the workshops took place before of the so-called *development phase*. After an initial analysis, the Sistag team wanted to in-depth discuss all the details and potential implications connected to the suggested objectives. At times, conversations were quite controversial amongst team members and demanding of the author of this thesis. According to the Design-driven Innovation Process Model, the *strategy phase* follows the *development phase* but in this case it dominated the cooperation project. This is why in Table 30 the dates of the workshops point to the progression of the project not the phases of the process as outlined in the model.

Towards the end of the cooperation (workshop 9, 19 Jan. 2011), a design agency was selected to develop a new corporate and brand design for Sistag. After a shared briefing (workshop 10, 9 Feb. 2011), the agency took over and the author of this thesis met with Sistag only twice after this: once to give feedback to the concepts proposed by the agency, and once for the final evaluation of the project.

The table summary in Appendix A.1 lists process, activities, etc. following the stages of the design driven innovation process model (see Chapter 4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.6.2 Analysis of design management absorption process

Triggers

The main reasons to engage in an in-depth absorption of design knowledge were ambiguous. The company was interested in finding new fields of application for their core technology and to position itself as a "problem solver" with premium services as well as products. The financial crisis acerbated the situation of producing at a high price in a

high price environment and brought the lack of a clear market positioning to the fore (*external trigger*). One of the main problems stated was the lack of traction of their sales representatives when trying to acquire new business (workshop 1, 2, 3). The company was aware that some of their problems were caused by an unclear brand architecture and corporate identity leading to misunderstandings *(internal trigger)*.

Acquisition

After an inquiry into different aspects of the company such as competitors, potential for product innovation, brand values, product language, market positioning, etc., the Sistag team developed a four-layered *innovation hypothesis*. It included the following aspects: 1. Fix brand architecture and develop new corporate identity, 2. Develop service organisation abroad, 3. Align product language and product portfolio with brand values, 4. Develop communication strategy (see document innovation hypothesis, 4 June 2010). All of this was novel to the company but did not constitute an innovation for the market. So more precisely the innovation hypothesis should be called a *design strategy,* since it focused on areas where design and design management would be able to make a contribution to position the company[87]. This document became a programme guiding the project and was often referred to (workshop 5; e-mail 2 Feb. 2011; workshop 12; evaluation, 14 May 2012). The acquisition of design knowledge connected to these four layers was successful, even though the design strategy was not undisputed in the team.

Assimilation

As mentioned before, the Sistag team went to great lengths of discussing the implications of the design strategy. Finally, it decided to focus on the development of a new corporate design using the product brand Wey as the corporate brand, and to realign all corporate communication media. The *design briefing* developed by the head of marketing and revised in a workshop with the author of this thesis bears witness of the manifold output of three workshops (see document design briefing). It entailed a background to the company and information about it, market potential, products, target groups, market segments, competitors, envisioned positioning, marketing strategy so far, design work, measurement criteria, results from the communication audit, etc. The briefing was discussed with the agency (workshop 10) and used as a framework for the discussions during the development process (statement of CEO during final evaluation, 14 May 2012).

Socialisation

This was the only project, during which a team of three senior managers was present at nearly all workshops. With the exception of one additional member the whole board was involved. The team remembered most of the tools used during workshops such as brand personas or customer journeys but with the exception of the above-mentioned design strategy and design briefing did not use them again. Nevertheless, the team posits to have

[87] At an early stage of absorption the term innovation sounds more familiar to companies and is less likely to be rejected.

understood the importance of design principles and approaches such as a human-centred and a stakeholder focused outside-in perspective for their business and processes, or the importance of emotions in communication. The CEO intends to include the design strategy in the overall corporate strategy (evaluation, 14 May 2012) to foster implementation at all company levels.

Transformation

The author of this thesis were invited to discuss *concepts* and *mock-ups* of the new corporate identity including visuals, wire frames of the new website, give-aways, etc. (workshop 12). There is the evidence for a successful design management absorption during transformation phase; based on the statements of the team (evaluation, 14 May 2012) we can assume that the concepts and mock-ups allowed for an informed decision making of the Sistag team.

Exploitation

Even though a touch point analysis using a *customer journey* had been done, the Sistag team decided to prioritise some layers of the *design strategy* over others because of time constraints (as communicated in workshop 11). The company focused on the development and implementation of the new corporate design and communication strategy leaving out the development of a service organisation and the alignment of the product language with a more focused set of brand values. However, the company posits that it will follow-up on these two points in the future (evaluation, 14 May 2012).

Outcomes

The central outcome of the project was the re-naming, re-branding of the company. It was considered a milestone in the history of the company (evaluation, 14 May 2012). Employees as well as sales representatives in different countries received the new corporate identity with acclaim (evaluation, 14 May 2012; press articles). Even the owner family was convinced that Wey, the former trademark of the products, now rightfully replaces the corporate brand Sistag, which is an abbreviation of Sidler and Stalder AG containing the family names of the two owner families (phone call statement of design agency, 15 May 2012). The team recognised immaterial effects of the new corporate identity on their workforce, partners and distribution channels abroad: through the unified company brand the *international presence and market positioning* of Sistag became evident to all stakeholders (statement COO during evaluation, 14 May 2012). As stated before, the CEO plans to include the design strategy into the business strategy to support implementation. It was also said that the many discussions about brand values, naming and positioning had strengthened the team; the overall willingness to change had grown considerably.

Table 25: Analysis of design management absorption progression based on indicators Sistag

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence					
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence					*Customer experience perspective introduced and applied but not yet implemented at all touch points (see e.g. product language)*
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
Evidence	*Four layered design strategy to support positioning (evaluation, 14 May 2012)*	*Detailed briefing, presented to designers (19 Jan 2011), refined with agency present (18 March 2011)*	*No repeated use of tools but approaches recognised as valuable to position company and unify company; employees accept new identity tools (evaluation, 14 May 2012)*	*Informed discussions during concept development (statement of CEO, 14 May 2012).*	*Company is willing to implement an integral customer experience strategy over time (evaluation, 14 May 2012)*

6.1.6.3 Discussion of progression of design management absorption

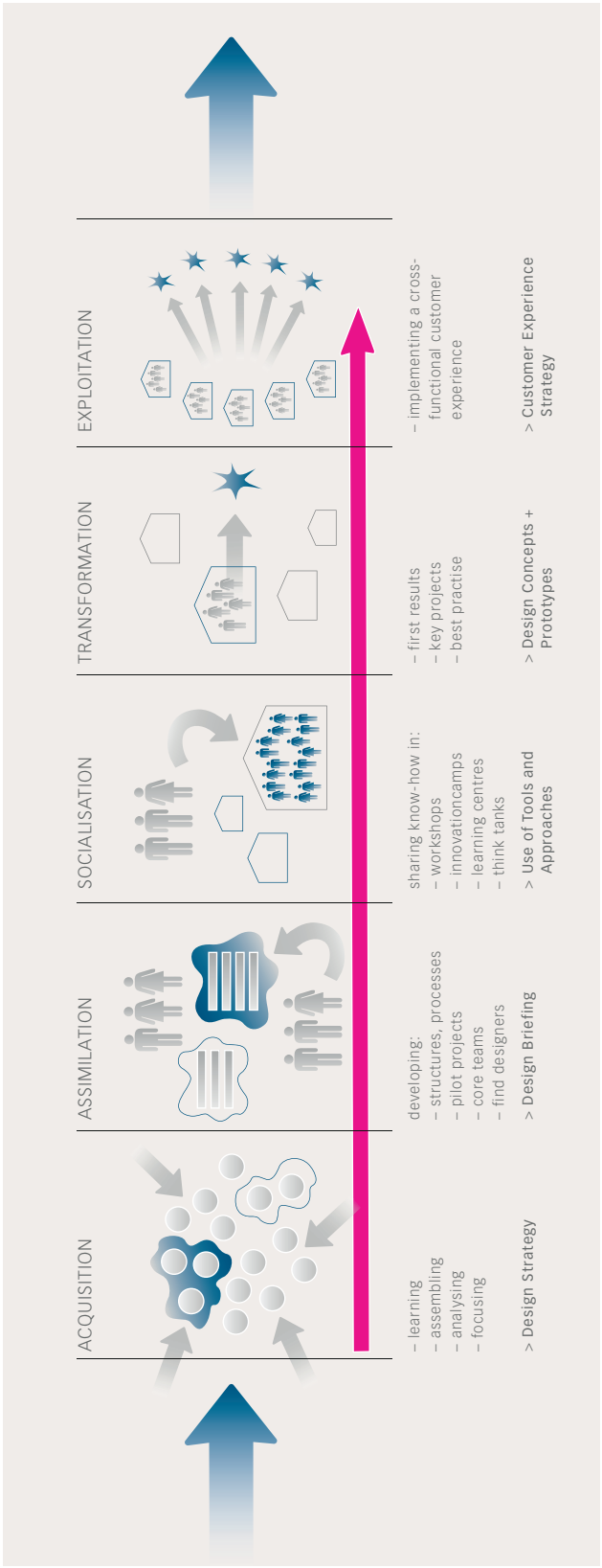

Figure 26: Progression of design management absorption of Sistag

The team of Sistag and the author of this thesis agreed on the same progression of design management absorption.

During evaluation interview (14 May 2012), the Sistag team presented a list of findings from the project. One of them concerned their understanding of design: In their earlier perception design was the same as product design and, today, the team is aware that design in different ways affects all company processes. The team understood that this perception of design is the foundation of a new design management capability. The CEO also acknowledged that their business needed an "emotional" as well as a functional or technological perspective.

In this case, the concept (Junginger, 2009, Gorb, 1990) that a corporate design process is an inquiry into the company, its history, values, future aspirations, customers, etc. driving change became tangible. The team understood that design was making identity and strategy visible to internal and to external stakeholders alike. In addition in 2011, the company did financially really well. The synchrony of business success and of the new company positioning was surely supporting the acceptance of design as a driver of change in an otherwise very technology-driven company.

The revitalisation of the corporate identity and the clarification of the market positioning can also be connected to the notion of *dynamic capability* as described by Zahra and George (2002). One outcome of new knowledge absorption is strategic flexibility. During evaluation interview (14 May 2012), the team stated that it had become more ready for change, which is a prerequisite of strategic flexibility.

6.1.7 Case Study 7 – Vaporsana

Table 26: Company details of Vaporsana

Name of company	Trade	Number of employees	Innovation project
Vaporsana AG	Manufacturer and retailer of steam showers	10	Reengineering, redesign and repositioning of a steam shower

6.1.7.1 Introduction

Vaporsana is a family owned business, which today is managed in the third generation. The grandfather of the current CEO invented a system to gently produce steam inside of a shower by heating up water and herbs – pretty much like cooking a tea – and without using pressure. This soft form of steam production is unique on the market but before the start of the innovation project the system was only able to fill small spaces with steam for a single not for two or more persons. Also the product language or the uses of materials were out-dated provoking connotations of medical equipment instead of a consumer good. Accordingly, the customers were people over 55 years, at a time when wellness and the fondness for personal health and fitness were booming in Switzerland (and probably elsewhere in Europe).

After the first three workshops, it became quite evident that the re-design of the product would cost more than a micro enterprise with 10 employees – two of them the father and the mother of the CEO – could afford. Vaporsana applied for government funding of so-called NRP money (the National Regional Policy programme, see 5.2.). This kind of programme, however, does not fund single companies; there needs to be a wider form of benefit for the region such as the creation of new employment or of a regional supply chain around a specific innovation. The organisation of a small local consortium of suppliers and the development of a proposal took some time; so shortly after the first workshops, the proposal writing brought the project almost to a halt for a few months.

More turbulence during the approximately two years of cooperation between the author of this thesis and the company was caused by the idea of the CEO to fuse his company to another one, which is in the same trade selling showers and saunas but not manufacturing any products itself. During 5 workshops of the overall 16 workshops, the to-be business partner and/or his marketing manager were also present bringing up their need to discuss strategy, branding, corporate design, etc. The two CEOs eventually decided not to merge their companies. This decision came as a surprise, since their plans had caused quite a bit of work, confusion and more delays.

Another area of turbulence was at times, the relationship to the industrial designers commissioned for the technical improvement of the steam shower as well as for the design work. They were present during first workshops (see Table 33) and cooperated on framing the problem. Vaporsana, however, had never collaborated with designers before and for a long time did not actively shape the working relationship in form of a contract with the two designers. In the beginning, the CEO also did not pay them in time; later, he demanded to have all intellectual property handed over to him[88]. Additionally, the project did not really move forward since the end of 2011, because of delays in solving some of the technical problems. While the CEO was blaming the designers (evaluation talk, 23 May 2012), the designers were blaming him (telephone talk, 25 May 2012).

As can be seen on the table summary (Appendix A.1) the Vaporsana project was quite an intense but also a promising one given current market trends. The work on the steam shower included three areas of improvement: the reduction of parts and thus the complexity to assemble the shower; the improvement of the effectiveness to produce steam (to fill bigger spaces, and thus, extend the product portfolio); the modernisation of the aesthetics of the steam shower. Later in the project, more design work was done on adapting the corporate identity of the company to become appealing to customers from 40 years upwards.

[88] In Switzerland, author's rights remain with the designers at any time but the rights to exploit the IP are being sold to the party commissioning design work.

At the time of the evaluation talk in May 2012, the shower had already been introduced to the market at a fair in Bale (Jan 2012), although many technical details were not in place yet. It was planned to actually launch the product by summer 2012, however, more delays were occurring and final work was progressing slowly.

The table summary in Appendix A.1 lists process, activities, etc. following the stages of the design driven innovation process model (see Chapter 4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.7.2 Analysis of design management absorption process

Triggers

In the Vaporsana case an *internal* as well as an *external* trigger were at work to initiate the project. After having taken over from his parents, the CEO wanted to modernise the company (evaluation talk, 23 May 2012)[89]. The grandfather had invented the system; however, his son had not considerably improved it and thus was missing out on some of the market opportunities such as steam showers for two. In addition, potential resellers of the shower confronted the grandson with the fact that they thought the steam shower old-fashioned and did not want to include it into their product portfolios. Feedbacks from a local knowledge exchange organisation and Swiss Design Transfer confirmed the opinion of the retailers.

Acquisition

During the first workshop, a *hypothesis* was formulated revolving around the market opportunity an improved and modernised steam shower would be opening up for the company, especially by targeting younger customers. The two product designers, one of which had a engineering as well as a product design background, were commissioned to do a *feasibility study* based on the hypothesis. It revealed that there was potential for improvements and cost reduction on the technological, the manufacturing as well as on the aesthetic level of the steam shower (12 March 2010). During evaluation (23 May 2012), the CEO stated that the hypothesis strategically guided the project during the product development as well as the corporate identity adaptation phase.

Assimilation

The goals formulated in the feasibility study became the first *design briefing* (see documents of workshop 3) including the three steps of *reduction* (of parts of the steam shower for ease of manufacture), *optimisation* (of effectiveness of steam production for bigger spaces) and *modernisation* (of aesthetics of the shower). The briefing was guiding the development work and also used during communication with external stakeholders such as political

[89] As mentioned in the literature review in Chapter 3.5 on innovation and innovation processes in SMEs, levels of inward and outward oriented innovation fluctuate across time in family-owned businesses and can be influenced by generational change (Zellweger & Sieger, 2010).

authorities or the partners of the NRP network (see NRP proposal). In the briefing, the CEO expressed specific appreciation for the benchmark of competitor products to understand market positioning, and the mood boards in the briefing to keep the aesthetic vision of the future product (evaluation talk, 23 May 2012). In spite of the existence of the briefing, there were several conflicts with the product designers: one on IP, and one on the division of labour between designers and company during product development (see next paragraph). At times, there existed different interpretations of the briefing. Later in the project (22 Nov 2011), a communication designer was sourced for the adaptation of the corporate design as well as for the communication media.

Socialisation

In the beginning, the CEO, his parents, and the technical manager participated in the workshops. While the parents were very enthusiastic about the project, the technical manager did not easily accept the engineer/designers (evaluation talk with CEO, 23 May 2012; evaluation talk with designers, 25 May 2012). He stuck to the opinion that the company could have done the improvements itself. Conversely, the designers pointed to a lack of understanding of the nature of the project: The whole company had yet to understand that product design develops industrial goods (not bespoke products), which are easy to manufacture, assemble, and to install (telephone call designer, 25 May 2012). The technical manager as well as the owner-family were not trained, not motivated or under too much pressure from daily business to prepare for serial production and to conduct the search for the right suppliers, calculating the product prize, or coordinating the network (telephone call with designer, 25 May 2012). This led to frustrations of all involved parties. Concerning the repeated use of design tools and approaches, the CEO states to have understood the concepts of product language or of design as an interfacing activity of design and technology (evaluation talk, 23 May 2012). This appears to be quite an erratic form of absorption of design management approaches, given the number of workshops conducted with Vaporsana. Designing has been left to the designers, and design management to the author of this thesis (see also point 6. Exploitation).

Transformation

During product development there existed *two forms of prototypes*: a functional one, with which the effectiveness of steam production was tested (29 March 2011 and thereafter), and 3-D renderings to visualise design concepts of the shower. Both allowed for an informed discussion and decision-making between engineer/designer and family. Once the family overhauled one aspect of the construction design because they did not find it practical (workshop 12): However, as mentioned before the lack of division of labour and technical support from the company hampered product development.[90]

[90] Since evaluation talks with the CEO and the designers brought the problem to light, it might be accessible for a solution now.

Exploitation

The most pressing question besides modernising the product was the need to brush up the corporate design and communication media to align product and brand. Quite a lot of energy of this action research project went into discussing branding issues, partly triggered by the plan to merge two companies (workshops 8, 11, 13, 14, 15). In addition, during workshop 7 a ***customer journey*** was used to identify gaps in the customer experience of Vaporsana. While the CEO absorbed the concept of customer experience (and is willing to implement it as soon as possible), he manifested difficulties in understanding concepts of corporate design and branding, and was highly depended on the support of the author of this thesis or of Swiss Design Transfer (evaluation talk, 23 May 2012; personal observation of author of this thesis).

Outcomes

At the time of the evaluation (23 May 2012), the new steam shower was not finished yet. Nevertheless, the CEO is optimistic that the work will be finished soon. Given this, the company – at least from an outside perspective – will have made a visible change from a provider of a useful niche to an optimised serial product with the potential to reach a much bigger audience. Also the corporate design and the marketing communication media will have been brushed up in a way to support a Swiss as well as a European launch of the improved steam shower. However, at this point in time, there is no evidence that the company will have improved its innovation and production process and gained more strategic flexibility through the absorption of design management capabilities. At least presently, limited resources hamper a consistent and timely innovation and design management process.

Table 27: Analysis of design management absorption progression based on indicators Vaporsana

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence					
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence			*CEO understands some design concepts but has problems to lead production team (evaluation, May 2012)*	*Unclear division of labour and limited resources of company hampers re-engineering of steam shower (evaluation, May 2012)*	*Company intends to orchestrate touch points around new product but is not ready yet.*
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision-making of management	Customer experience strategy implemented at all company touch points
Evidence	*Hypothesis guiding NPD including corporate design and marketing communication media (workshop 1)*	*Design briefing as a result of a feasibility study by designers (workshop 3); second design briefing steering CD-work (workshop 14)*		*Physical prototypes and 3D-renderings allow for discussion and decision-making.*	

6.1.7.3 Discussion of progression of design management absorption

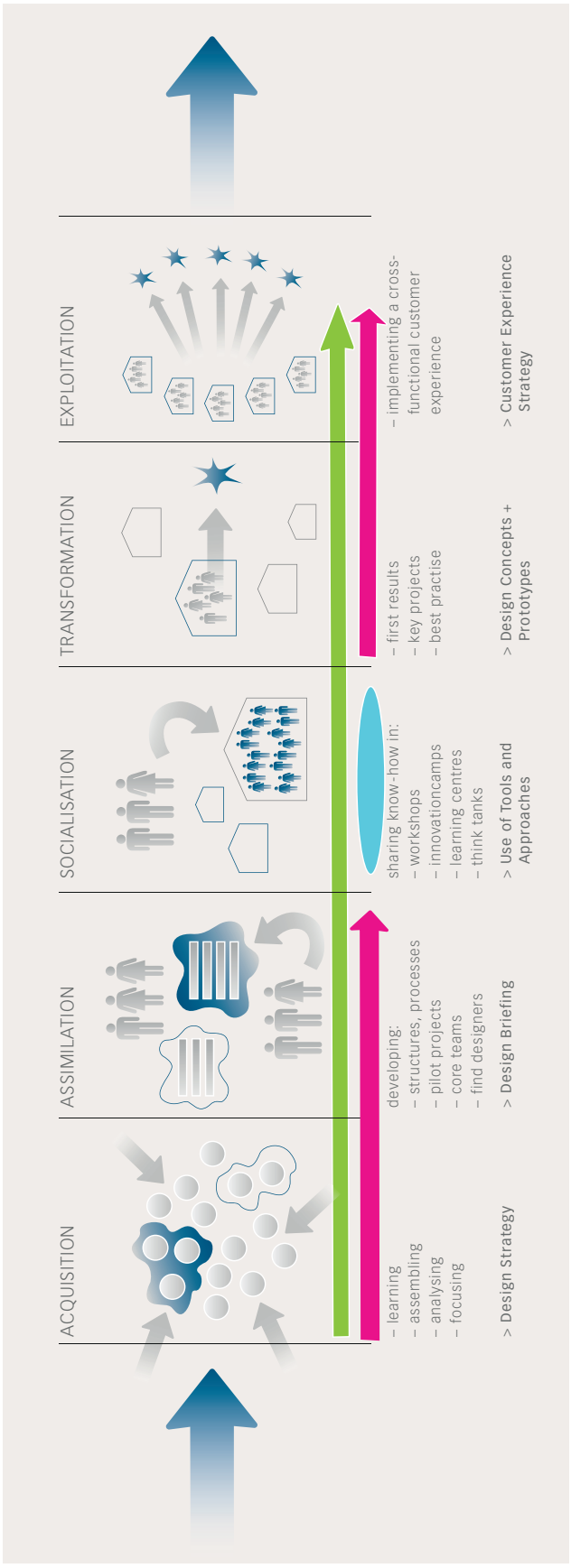

Figure 27: Progression of design management absorption of Vaporsana

The green arrow indicates the absorption progression according to the CEOs opinion. The author of this thesis (red arrows) does not yet see any evidence of complete design management absorption. It can be doubted that the company understands the implications of manufacturing an industrial consumer good (gap in perception in light blue).

The Vaporsana case has been a turbulent and complex one, including the development of a regional network of companies under the NRP-programme to act as a supply chain for the new steam shower. The CEO states that the project has led him to a more interactive way of communicating with regional stakeholders and has made his company more popular. However, only a few of the appointed network partners will contribute to the future steam shower.

The development of the network was very demanding of the CEO, who was doing a lot of extra hours besides his usual operational share of work. Thus, the plan to merge his company to a reseller of showers and saunas from the Zurich area was led by the CEO's desire to share the burden of making business with a partner (evaluation talk, 23 May 2012). However, these plans caused messiness in the area of branding and marketing communication to an extent that at the fair in Bale (Jan. 2012) the new steam shower was presented under the name of both companies.

These two observations illustrate that this small family-owned business with a tradition to individually serve their customers by installing bespoke steam showers, with a CEO who is trained a banker, and a technical manager who is a craftsman, was overburdened by the project. In the company, the necessary expertise to manufacture a serial product is not a given and designers were blamed for not providing the company with a "finished" product. So a fundamental design management capability has not been developed during the project, which consists in coordinating internal resources (the production team) with external resources (the designers) and in understanding design's stake in it.

Given the fact that this company did receive a lot of attention (16 workshops and many informal meetings), the company did not sustainably absorb new design knowledge but needed support at each step of the way. While in the beginning, a company absorbing new knowledge has to rely on external sources of expertise the company has also to actively engage in knowledge absorption. For design management to become a dynamic capability, resources need to be configured and re-configured to optimise processes.

6.1.8 Case Study 8 – Alpnach Norm

Table 28: Company details Alpnach Norm

Name of company	Trade	Number of employees	Innovation project
Alpnach Norm Schränke AG	Industrial carpenter (cupboards)	160	Development of a sideboard system

6.1.8.1 Introduction

The Alpnach Norm is an industrial carpenter with a core competence in manufacturing and selling built-in closets. 40 percent of the firm's production volume goes into bespoke cupboards for privately owned houses, the rest goes into the so-called "object market", new real estate, which will be rented out[91]. The CEO decided to join the action research project because she had hired a young and curious product manager, who had just graduated from a school for wood technology interested in a design approach to new product development. With a new product line of "designed" sideboards the CEO intended to respond to customers that had asked for furniture that complemented the built-in closets. She stressed the point that the new product line had to resonate with the core business and values of Alpnach Norm.

Alpnach Norm is a family-owned business run by the daughter of the founder, who started the company in the mid-sixties. The name of Alpnach (a village located at the shore of the Lake of Lucerne where the company's main site is) and Norm (equalling the English word "norm") relates to design values of the sixties as formulated by Max Bill[92]; his design philosophy stressed the importance of the "good form" meaning the simple, timeless form that sets functional values before aesthetics and mere fashion trends. While this philosophy and the firm's name raised the right expectations with the architects of that time, the notion of norm and standardisation grew outdated overtime. The company's claim tries to give credit to this new development with the statement "individuality is our norm"[93].

The paradox embedded in this slogan proofed to be one of the main questions driving the sideboard project. Early on it was decided that the sideboard needed a "system's character" that reflected the "individuality is our norm"-claim while at the same time making an intelligent contribution to the product portfolio of the company. After first concepts were there (November 2011), it was discussed how to brand the new sideboard system and decided to introduce a brand for a new product category call AN+ (Alpnach Norm plus).

Analysis of the business and its environment during first workshops revealed that Alpnach Norm was in a good position to compete with other industrial carpenters but not equally well equipped to compete with established furniture brands. Alpnach Norm, after all, was building on a tradition of craftsmanship not of design. It also became evident that the average customer was over 50 and that there was a lack of young ones, who liked special designed products.

During workshops (see table summary in Appendix A.1), design management tools such as future customer personas, user scenarios, the design history of sideboards, design management approaches, etc. were introduced and well received by the CEO to

[91] Switzerland is a country of mostly tenants renting apartments not owing them.
[92] The Swiss architect, designer and artist Max Bill had written, „Die gute Form" (1957) and influenced a whole generation of Swiss and German design professionals with it.
[93] Translation by author of this thesis

support a new perspective on the existing business. However, she lacked time to consistently participate in later workshops. The main driving force moving the project along was the interaction between the designer and the product manager.

The table summary in Appendix A.1 lists process, activities, etc. following the stages of the design driven innovation process model (see Chapter 4.3.5). Contents marked in blue are based on second hand information; comments marked in red are special observations (see Chapter 5.4.1. for details).

6.1.8.2 Analysis of design management absorption process

Trigger

The CEO and the product manager stated that curiosity was the main trigger to embark on the action research project. The CEO was open to expand the company's capabilities and to "break away from the norm" (evaluation talk, 31 May 2012). The product manager felt motivated at the prospect of cooperating with the author of this thesis and the designer. So the *willingness to absorb new knowledge* actually triggered the project. Before project start, the product manager sourced the "right" designer with an emphasis on someone who was willing to interact with him[94].

Acquisition

During workshops 1 and 2, a *design strategy* was formulated stating that Alpnach Norm wanted to further differentiate itself from its competitors such as other industrial carpenters by introducing designed products as well as by proposing a more differentiated Alpnach Norm brand signature. Another goal of the design strategy aimed at raising brand awareness among young audiences. Accordingly, during the first workshop, a young future customer persona was developed that was referred to on various occasions during product development and product branding.

Assimilation

After the first two workshops, the product manager wrote a first draft of the *design briefing,* which was refined in workshop 3. The briefing was binding for the designer but also expanded at some point during concept development. During concept presentation (workshop 5), the designer introduced the idea to use accessories manufactured by local companies to further characterise the sideboard. The board of Alpnach Norm agreed to pursue this idea further (e-mail, 30 June 2011). The product manager and the CEO stated that the written design briefing had given direction to the project; they considered it an important tool to learn how to handle design and a designer. In the product manager's view personal talks had been equally important to transfer Alpnach Norm's values to the designer (evaluation, 31 May 2012).

[94] His gut feeling proofed to be right and even though there were conflicts with the designer during the project the good work relationship was maintained at all times.

Socialisation

Issues that shed light on the socialisation of design management knowledge emerged on various occasions during the project (workshops 1, 2, 3; evaluation, 31 May 2012). While the CEO and the product manager were open to experiment with design tools such as user scenarios or customer personas, it was also said that Alpnach Norm has a tradition of craftsmanship. Some employees remained sceptical in regard to the sideboard's added value stating that they could have done that without the help of a designer (related by product manager on 3 April 2012). The CEO stated during evaluation talk (31 May 2012) that they should have involved the staff more deeply into the project to generate buy-in. A challenge (as perceived by the product manager, evaluation, 31 May 2012) constitutes the fact that the new sideboard needs to be presented by sales in a congenial way stressing the special qualities of the AN+ product category. He felt that sales representatives were curious but had not understood the difference to their standard products yet. The people involved in the product development process, on the other hand, cooperated well, in spite of the little time resources available (evaluation, 31 May 2012). In the product manager's view, this was due to the fact that the designer was open minded and did not present himself as the panacea to all problems of product development. The sideboard did get good first feedbacks at the Bale fair (15 Jan. 2012), a fact that was instrumental in reassuring company members that they had done something good.

Transformation

The designer systematically introduced a series of sketches of *first concepts* (workshop 5), *cardboard mock-ups* (workshop 6) and *prototypes* (workshop 7) that allowed for an informed discussion and re-briefing if necessary. The pilot series was presented at the Bale fair (15 Jan. 2012), and, later, a group of experts was invited to give feedback (workshop 12).

Exploitation

After prototypes were ready, a new product brand category (AN+) was created that sets the new sideboard apart from "norm" products and that allows for more product extensions in the future (workshop 8, 10). A *customer experience strategy* was developed (workshop 11) including the measures such as the change of exhibition spaces and entry halls, communication strategy and media, new sales channels, etc. At the time of the evaluation talk in May 2012, all these measures had not been implemented yet but things were well on their way[95]. However, the involved designer (phone call on 3 June 2012) doubts whether Alpnach Norm, a company with a tradition as an industrial carpenter will be able to launch the sideboard in such a convincing manner as to compete with brands from the established furniture market. The CEO is aware of the fact that the process of fully exploiting design at all company touch points will take a while and also will depend on the success of this pilot project (evaluation, 31 May 2012).

[95] In Fall 2012, the exhibition space was changed and the product was presented at a design fair.

Outcomes

The visible outcome of the process of design management knowledge absorption was a sideboard system of modules, surfaces and additional accessories that build on the Alpnach Norm tradition by using its standard modules as building blocks. One of the most interesting accessories in connection with the sideboard is a lamp that is blown by a traditional regional manufacturer, each piece being one of a kind – a reference to the tradition of craftsmanship. However, the system also breaks away from tradition by limiting the size of these standard modules and the number of materials and surfaces to choose from. This impacts on the identity of the company and on the way the sales representatives will have to present the new product. At the time of evaluation, the CEO waited for proof from the market that the sideboard would sell (31 May 2012). Apart from that, she thought that her employees would have to become more creative to ensure long-term survival on the market. She also was aware that she had not attributed the necessary resources to the project and would need to do that in the future. These statements express her wish for more *strategic flexibility* and her understanding that (design) leadership needs to dynamically reconfigure resources.

Table 29: Analysis of design management absorption progression based on indicators Alpnach Norm

	Design Strategy	**Design Briefing**	**Use of tools and approaches**	**Design concepts / Prototypes**	**Customer experience strategy**
Complete failure	Neither design strategy nor commitment	No design briefing	No repeated use of tools and approaches	Neither concepts nor prototypes	No customer experience strategy
Evidence					
Good enough	Potential of design recognised, design strategy partly formulated (as a hypothetical exercise)	Sketchy design briefing and/or not used in development phase	Erratic and sporadic choice of use of tools and approaches	Concepts and prototypes that don't convince or do not comply with requirements	No integral customer experience strategy and implementation
Evidence			*Since there are no new design projects yet, the evidence for re-use is weak at this point in time.*		*Customer experience measure ready by end of the year 2012 (31 May 2012)*
Full success	Added value of design recognised, design strategy defined, communicated and committed to	Complete design requirements developed and reframed in collaboration with designers	Use of tools and approaches by more than one company member; use at later stages and in later projects	Concepts and prototypes that allow for informed discussion with designers and decision making of management	Customer experience strategy implemented at all company touch points
Evidence	*Design strategy including strategic goals and a sketchy product strategy (workshop 2)*	*Briefing guided through process; re-briefings in collaboration with designer was possible (workshop 5)*	*CEO commits to re-configure resources for future projects (workshop 6); product manager would use tools again (31 May 2012)*	*Consistent use of mock-ups, prototypes, pilot series (workshops 5, 6, 7, 12)*	*Start of and commit-ment to implement-tation of measures such as change of exhibition, entry hall, media strategy, etc. (31 May 2012)*

6.1.8.3 Discussion of progression of design management absorption

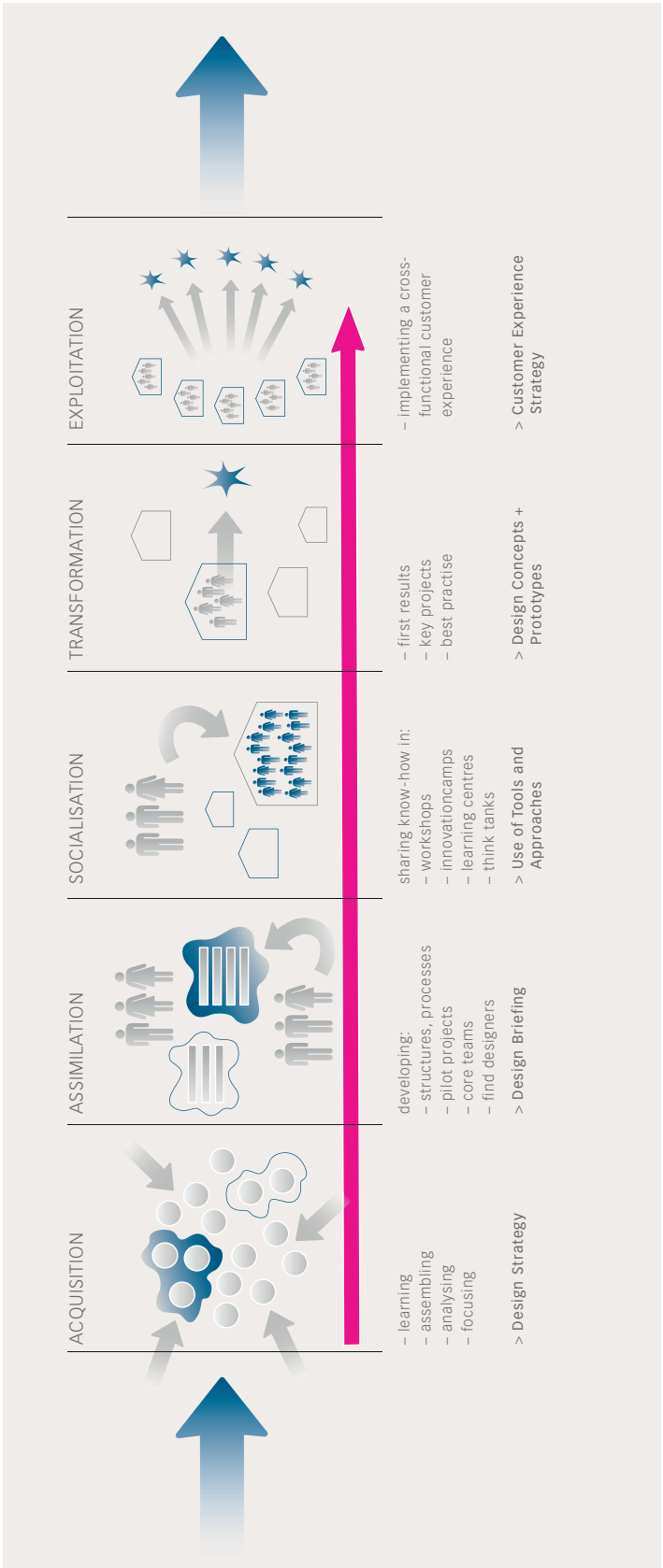

Figure 28: Progression of design management absorption of Alpnach Norm

The CEO, the product manager as well as the author of this thesis agree that the design management absorption has progressed into the exploitation phase and that the customer experience strategy is underway of being implemented.

Even though the product has not been formally launched yet, at this point in time (evaluation, 31 May 2012) the Alpnach Norm case can be regarded as a successful one concerning design management absorption. The main success factor during the development of the product, the brand as well as the customer experience strategy was the open and tolerant approach of the young product manager to the designer involved. During product development many technical as well as production details had to be dealt with but since nobody had to compete for the field the process proved to be a very harmonious one.

Even though there were several bumps in the collaboration of the designer with the company, it did not affect the overall quality of the work relationship. E.g. the designer went over budget, which greatly infuriated the CEO who disapproved of his "artist-mentality", but the product manager dealt with the problem with more calm later, and the CEO did not interfere with the relationship of the two. On the contrary, she sometimes left her employee alone for lengthy periods of time due to her pressing workload, a fact, which at times put too much pressure on the product manager and pointed to the fact that there were no established innovation processes at Alpnach Norm.

Once the pilot series was presented at a fair, and feedback received from experts of the field, trust in the market potential was built. According to the CEO the internal response to the new product was positive as well. One week before the final evaluation (31 May 2012), the CEO and the product manager held an internal event for employees from production and sales about the development process and the characteristics of the product. She felt confident that in the future her staff would support innovation projects better.

Whether Alpnach Norm will keep exploiting design as a strategic resource to position the company and to dynamically adapt to environmental challenges will depend on the success of the new product on the market and on finding a new original positioning between carpentry and design. So her promise to allocate more resources to innovation projects in the future can be interpreted as a sign of design management as a *dynamic capability* but will have to stand the test of time.

6.2 Cross-case comparison

The purpose of the now following cross-case comparison is to trace *patterns*, either *similarities* or *differences* of companies' absorption progression and make them accessible to *interpretation*. This is why firstly, this chapter compares the afore-mentioned eight company case studies mapping their individual design management absorption progression on one figure (Figure 29).

Secondly, Table 30 summarises the ratings of design management absorption progression from the eight individual case studies using the categories of *acquisition*, *assimilation*, *socialisation*, *transformation*, and *exploitation* of the Design Management Absorption Model (DMAM) as a reference (for details refer the description of the DMAM on p. 121). The summary also includes the two categories of *triggers* to initiate knowledge absorption and *outcomes* of it.

6.2.1 Comparison of progression of design management absorption

Figure 29 (see overleaf) gives an overview over the progression of the individual design management absorption of all eight firms. During the individual case studies (Chapter 6.1.1.), a darker shade of blue indicated the main score of knowledge absorption, while a lighter hue of blue pointed to a drift or tendency towards another score. To support the comparability some of these differentiations made during individual case studies are left out; only the main score is displayed. A long beam signals "full success", a half beam indicates a "good enough" and a missing beam points to "failure" of design management absorption. The order of companies on the diagram follows the sequence, in which the companies have been discussed in the case study chapter.

As stated before, in the cross-case comparison four out of eight companies were able to realise absorptive capacity (Studer Maschinenbau, Sistag, Vaporsana, Alpnach Norm). One company "intermitted" or "erratically" absorbed and realised absorptive capacity, thus making it questionable whether it can be classified as realised design management absorption or not (Ledagio). Three companies stopped or interrupted the project before ACAP could be fully realised (Stiftung Schürmatt, Schreinerei Bieri, Tofwerk).

In addition, the four successful companies Studer Maschinenbau, Sistag, Vaporsana, and Alpnach Norm absorbed design management knowledge to differing degrees and can be further divided in two subcategories: the ones that socialised design knowledge more deeply familiarising different company stakeholders with design or repeatedly adopting design tools (Studer Maschinenbau, Sistag, Alpnach Norm); and the one, which used design to improve the product, the appearance, or the company's touch points but without more profoundly integrating design approaches into their company routines (Vaporsana).

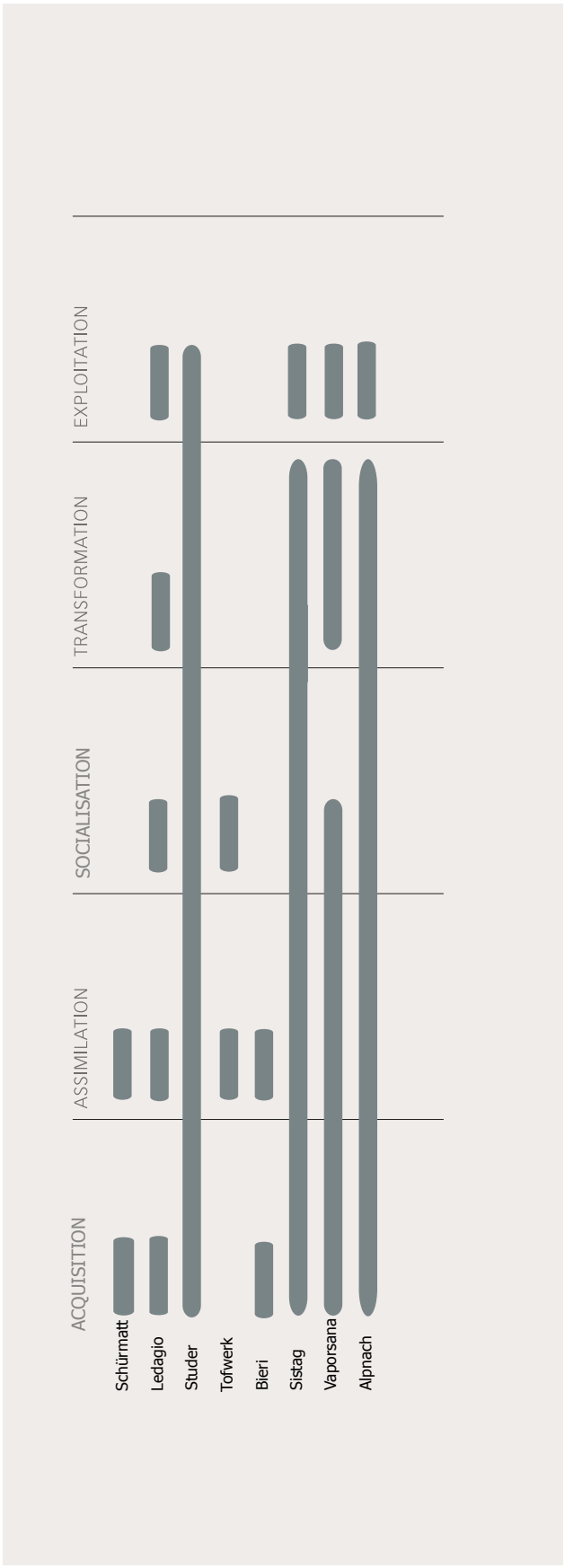

Figure 29: Comparison of progression of design management absorption of eight companies

This first arrangement in groups of the companies according to their overall absorption progression will become clearer by comparing companies throughout each phase of design management absorption, including triggers and outcomes of the process. The following Table 30 gives an overview over the progression of design management absorption based on the indicators at each stage (see individual case studies).

Table 30: Cross case comparison of progression of design management absorption based on rating of indicators at each stage

	Schürmatt	Ledagio	Studer Maschinenbau	Tofwerk	Schreinere i Bieri	Sistag	Vaporsana	Alpnach Norm
Triggers (internal, external triggers, listed in the order of primary and secondary trigger)	*Motivation to learn something new (internal); improve market positioning (external)*	*Create new market for B2C product (external); motivation to learn something new (internal);*	*Decline of traditional business; search for new fields of application for core technology (external); reorganisation of innovation organisation (internal))*	*Curiosity to understand the nature of design (internal); opportunity to position company with end-users in OEM market (external)*	*Detection of unmet user need and business opportunity (external); diversification of product portfolio (internal))*	*Positioning of high price product on market (external); unclear corporate identity and brand architecture (internal))*	*Missing out on market opportunities (external)); modernisation of company, products (internal);*	*Curiosity and willingness to absorb something new (internal); improve market positioning (external*
Acquisition								
Complete failure				*Design as strategic resource is received with ambivalence*				
Good enough	*Hypothesis formulated to guide qualitative research but no binding strategy for organisation*	*List of potential product UPSs and requirements; Partial design strategy to align brand and product; business strategy to create spin-off to market new B2C product*			*Development of product strategy including target groups; initial steps towards a business model*			
Full success			*Clear understanding how design "fits" in; design approaches such as human-centred design driving business strategy*			*Four layered design strategy to support business strategy*	*Hypothesis guiding NPD including corporate design and marketing communication media*	*Design strategy including strategic goals and a sketchy product strategy*

Assimilation								
Complete failure								
Good enough	*Briefing leading to research but without goals of design project*	*Briefing was deve-loped with resear-chers, then redefin-ed by designers and neglected during development*	*designers and neglected during process development*		*Sketchy re-briefing for container project between designer, company and the author of this thesis*	*Enhanced design briefing after workshop 2; business dimensions missing*		
Full success			*Implicit briefings during ongoing re-design of machine; briefing for design corporate communication and brand*			*Detailed briefing, presented to designers; refined with agency and used as a framework later during cooperation*	*First design briefing as a result of a feasibility study by designers; second design briefing steering CD-work*	*Briefing guiding through process; re-briefings in collaboration with designer possible*

	Schürmatt	Ledagio	Studer Maschinenbau	Tofwerk	Schreinerei Bieri	Sistag	Vaporsana	Alpnach Norm
Socialisation								
Complete failure	*No repeated use of tools and approaches*				*Company turns to engineers to finalise product idea*			
Good emough		*CEO uses some of the tools but applies them without a deeper understanding and erratically*		*Construction of product partly based on design criteria such as reduction of complexity, serviceability*			*CEO understands some design concepts but has problems to lead production team*	
Full success			*Design approaches such as human-centred design driving business strategy; tools such as visualisation used to drive change, customer journey re-used as guiding instrument*			*No repeated use of tools but approaches recognised as valuable to position company and unify company; employees accept new identity tools*		*CEO commits to re-configure resources for future projects; product manager would use tools again (has to be put in action)*

Transformation								
Complete failure	*Project was stopped*			*Prototype of shield developed by engineer (not designer)*				
Good enough		*Decisions on materialisation and production details based on prototype; done without involvement of designers*			*No fully functional prototypes lead to decision to interrupt cooperation with designers after workshop 3*			
Full success			*Increased understanding of e.g. use of visuals to communicate value to customers; in-depth understanding of interdependency of product functionality and product language*			*Informed discussions based on mock-ups during concept development*	*Physical prototypes and 3D-renderings allow for discussion and decision-making*	*Consistent use of mock-ups, prototypes, pilot series*

	Schürmatt	Ledagio	Studer Maschinenbau	Tofwerk	Schreinerei Bieri	Sistag	Vaporsana	Alpnach Norm
Exploitation								
Complete failure	*Project was stopped*			*Customer experience strategy developed but not implemented*	*Project was stopped*			
Good enough		*No integral customer experience strategy; partial implementation (website, brochure, etc.) after talks with various external experts*	*Integral CX strategy exists, committed to fully implement it*			*Company is willing to implement an integral customer experience strategy over time*	*Company intends to orchestrate touch points around new product but is not ready yet*	*ting measures such as change of exhibition, entry hall, media strategy, etc*
Full success								
Outcomes	*No outcomes*	*Foundation of a spin-off; product and branding strategy "Lighting sculptures" developed*	*Improvement of innovation organisation including design function; improvement of customer experience*	*No obvious impacts at the moment (because of lack of opportunity)*	*No outcome of this specific project*	*Unified company brand leading to more employee identification*	*Altered manufacturing process but not in place yet; altered corporate design*	*New product category, new marketing (POS, communication sales, etc.)*

Triggers

Abecassis-Moedas and Mahmoud-Jouini (2008) mention internal as well as external factors to trigger knowledge absorption (for details refer to the description of the DMAM on p. 99). This holds true for our eight companies: In all of them, *internal* as well as *external* circumstances and impulses triggered the process of absorbing new design management knowledge. In some cases internal impulses were the *primary* triggers, for example for Stiftung Schürmatt or Alpnach Norm. In some others external circumstances were the primary reason to engage in knowledge absorption. Here too we have successful and unsuccessful companies with respect to knowledge absorption.

Internal triggers were:

- The motivation or willingness to learn something new (Alpnach Norm; Schreinerei Bieri; Ledagio; Stiftung Schürmatt; Tofwerk)
- Organisational shortcomings such as an unclear corporate identity (Sistag)
- Out-dated structures, products and process of a family-owned business (Vaporsana)
- The re-organisation of the innovation vs. operational business (Studer Maschinenbau).

External triggers went from:

- Creating a new business (Ledagio; Schreinerei Bieri)
- The search for new fields of application for a core technology (Studer Maschinenbau; Sistag)
- Improving market positioning (Stiftung Schürmatt; Sistag; Alpnach Norm)
- To the wish to target new customer segments (Schreinerei Bieri; Ledagio; Vaporsana)

Common sense has it that a strong *external impulse* propels a company into the search for new ways of doing business out of the necessity to survive. This was true for Studer Maschinenbau, where the project oscillated between business development, design management, and change management because their "cheese business" declined. This was also true for Sistag, which feared loosing market share in their export business caused by the monetary crisis, or for Vaporsana AG when retailers commented that the family's products were not attractive for the growing customer segment of LOHAS (Lifestyle of Health and Sustainability segment).

However, also an allegedly *softer trigger* such as the *motivation* to learn something new was able to initiate design management knowledge absorption. This was the case for five companies, a fact that might reflect that design's reputation as a must-have for companies has increased with overall business sophistication of Swiss companies[96]. The CEO of Alpnach Norm e.g. expressed that she wanted to break out of "the norm" and

[96] Switzerland's economy fills in a top position in the ranking of the World Economic Forum 2011/2012 in the category of „business sophistication" that entails subcategories such as "extent of marketing" (see http://reports.weforum.org/global-competitiveness-2011-2012, accessed August 2012).

rejuvenate the company by putting the newly hired product manager in charge. The same was true for the CEO following in the footsteps of his grandfather and father. The motivation to learn something new such as to develop and launch a product for a new customer segment (Ledagio), or to meet an unmet user need (Schreinerei Bieri) was also highly interlinked with entrepreneurial activities, which have a certain overlap with design approaches[97].

In addition, it can be observed that the *strength* of a trigger was not only related to the circumstances that drove a company to embrace new design management concepts but also to the *clarity* of what a CEO or any other company member intended to achieve by acquiring new knowledge. Extreme cases are Tofwerk that never was sure whether design would add any value to their OEM and high-tech business as compared to Alpnach Norm, where the young product manager wanted to prove himself in his new position by developing the first product involving design.

In connection to a *trigger* and the *clarity* as to why to absorb new knowledge, an intermediary needed to have a certain *standing* and the company a *culture* conducive to absorbing new knowledge. Cohen and Levinthal (1990) introduced the notion of the "gatekeeper" who metaphorically speaking stands with one leg in the environment of the organisation and with the other connects with internal stakeholders. In five cases the gatekeeper was a single person, a CEO or the director; in one case it was a brother-sister couple (Schreinerei Bieri); in another a CEO and his product manager (Alpnach Norm); and in one case a team of three senior managers (Sistag). So in the observed SMEs the entry points of new design management knowledge are mostly top managers.

Although most gatekeepers guaranteed that design projects were handled with a certain priority, it also happened in several cases that they were not able to be intermediaries between the new knowledge sources (the author of this thesis, designers) and the rest of the organisation. In the Schürmatt case, the longer the project carried on, the more the director had to legitimise the use of human and financial resources for a project that was considered his personal hobby. At Tofwerk, the company culture of an adhocracy made it difficult to socialise design knowledge amongst engineers; in the case of Vaporsana a single person, the technical manager did not pro-actively cooperate with the industrial designers.

Acquisition

During acquisition phase, companies develop an understanding of how design "fits in" with their specific business (for more details refer to the description of the DMAM on p. 99). After analysing the current state of business affairs and use of design at the beginning of the acquisition phase, a variety of different strategies were developed depending on the starting point of the project or the situation of the company. Most of these strategies encapsulated perceived business opportunities and were formulated as a first *hypothesis* to

[97] That there is a certain overlap of design and entrepreneurship has been touched upon in the case study of the Ledagio (see p. 156).

be researched in more depth during the process of development. Here follows a categorisation of the different company strategies:

- *Design strategy as part of business strategy* to improve market share, positioning, etc.: by involving key stakeholders more deeply through an improved customer experience (Stiftung Schürmatt); by targeting new customer segments with a modernised product (Vaporsana); by discovering new fields of application of their core technology, building high user value into new products and propagating technological leadership through communication strategies and branding (Studer Maschinenbau); by targeting younger customer segments by introducing a designed product (Alpnach Norm); by improving brand architecture, communication, service and product language (Sistag)
- *Partial design strategy*: by aligning product language and brand values (Ledagio)
- *Product strategy:* by improving technological, functional, aesthetic levels of a specific product as well as its manufacture (Ledagio); by creating a new product for unmet user needs (Schreinerei Bieri)

With the exception of Studer Maschinenbau companies were not familiar with the notion of a *design strategy* as part of an overall business strategy. So the variety of strategies reflects the firms' degree of awareness of the potential of design to create added value at that point in time, their willingness to use it to achieve specific company goals, or their resistance to it. One company (Tofwerk) failed to formulate a strategy for a company specific purpose to use design. As can be seen from the list, the rest of the companies either focused on an immediate objective (e.g. Ledagio or Stiftung Bieri), or anticipated that later on there would be several strategic layers to be worked on (e.g. Sistag, Studer Maschinenbau).

At the beginning, strategies often consisted of only one or two sentences (Stiftung Schürmatt, Alpnach Norm, Studer Maschinenbau, Vaporsana). However, these succinctly formulated strategies were able to drive some of the projects like an underlying current towards their goals. E.g. the CEO of Vaporsana stated that he did not look at the strategy again but that is was implicitly guiding product development.

While strategy formulation is often described as an analytical process, most of the strategic intent of these company projects was encapsulated in customer and brand personas, user scenarios, customer journeys, or mood boards. E.g. the CEO of Alpnach Norm thought it valuable to put herself in the shoes of her customers through user scenarios to better understand the problem at hand and to give direction to product development. Also in the case of Studer Maschinenbau typical design approaches such as human centred (potential) user scenarios were adopted to formulate the design strategy and to develop "a feel" for the potential of the different fields of application for the water-jet technology.

Design tools and approaches *made strategy tangible* beyond the purely cognitive. However, while companies such as Schreinerei Bieri or Ledagio were considering the use

of design tools and approaches as a waste of time and resources, companies such as Studer Maschinenbau or Alpnach Norm used them to *intertwine* strategy formulation, business development, and product development.

Based on this small sample it can be concluded that the stronger the perceived business opportunity, the stronger the commitment of companies to move forward. Half-hearted, deficient or little formalised strategies (Schreinerei Bieri, Tofwerk, Stiftung Schürmatt) led to intermitted design management absorption and, in two cases, to the end of the design projects. Also the "power" of design to add emotion to strategy was welcome by those companies that succeeded to realise ACAP.

Assimilation

During assimilation phase, companies connect the potential benefits of design to concrete projects and activities. So after inquiring into the current state of the firm, its use of design and the formulation of strategies, the *design briefing* translated strategies or hypotheses into concrete endeavours. As such the design briefing constituted the first step of implementation and paved the way for RACAP. In the case of our companies this step included some uncertainties. For most of them the *assimilation* phase signalled the beginning of collaboration with an external knowledge source; thus, the successful briefing and sourcing of design expertise was instrumental for the quality of the future working relationship and the clarity of the scope of the project. In five cases (Stiftung Schürmatt, Schreinerei Bieri, Sistag, Vaporsana, Alpnach Norm) Swiss Design Transfer supported the process of sourcing external design expertise either before project start or during assimilation phase.

Design briefings applied to development processes by four out of eight companies (Studer Maschinenbau, Vaporsana, Sistag, Alpnach Norm). Stiftung Schürmatt, Ledagio, Tofwerk and Schreinerei Bieri developed briefings that were either incomplete or not applied to the ensuing processes. In the case of Vaporsana, a feasibility study done by the designers led directly to the formulation of the project goals. Sistag, after thorough discussions about the company's identity and current market positioning, formulated the most detailed design briefing.[98] Also "advanced" forms of briefings could be observed. In the case of Studer Maschinenbau, which already had built a trusted relationship with an industrial designer before, an on-going decision-making process between designer and SME took place without any formalisation in written form.

In contrast, the briefing for the qualitative research on key stakeholders of Stiftung Schürmatt did not contain any goals about what to achieve through the research. As a result its outcome was unclear and the organisation was unable (or unwilling) to put the findings into action. In the case of Ledagio, two briefings were developed: one together with the author of this thesis, one with the product designers. The fact that the second briefing was not binding for the CEO corrupted the relationship to such an

[98] The firm decided to replace its „old" agency by a new one; Swiss Design Transfer supported the selection process by inviting several design agencies to pitch.

extent that the designers do not want to be mentioned in relation to the product anymore (for details see case study on Ledagio, Chapter 6.1.2.). Also Schreinerei Bieri – after breaking off the relationship to the designers and the author of this thesis – neglected the more complex requirements of the briefing in exchange for simplified ones. So the briefings also played the role of a *contract* with a strongly relational character.

Throughout development processes briefings were used for the following purposes: to clarify the *scope* of the project and define the *design work* either together with the designers (e.g. Vaporsana, Alpnach Norm) or before engaging in collaboration with designers (e.g. Sistag); to give a *guideline* to project development and to set *boundaries* (Alpnach Norm) in terms of time, overall budget, deliverables[99]. At later stages, the design briefing became a *decision making* tool. E.g. in the case of Alpnach Norm the company gave the go-ahead to new ideas of the designer that had not been part of the briefing before.

Some companies learned that purely factual information is not enough to start design work but that company values or other intangible assets such as information about traditions or history are needed. E.g. the product manager of Alpnach Norm stated that the many talks with the designer to transfer *implicit knowledge* and the designer's ability to absorb and intuit company culture had been equally important.

To be of use for both parties – companies as well as designers – the best design briefings were *living entities* that could be stretched or reworked if necessary. Besides more formal ways of briefing the designers, informal or implicit information transferring subtle cultural values to the designer were considered useful. The CEO of Alpnach Norm further stated that they had to learn how to deal with a designer and that the briefing had provided a sense of safety during the process of absorption.

Socialisation

As an indicator for the socialisation of design management absorption bridging PACAP and RACAP is the repeated use of design tools and approaches was defined. Two companies (Stiftung Schürmatt, Schreinerei Bieri) failed to socialise design management knowledge, three companies sporadically re-used design approaches and tools (Ledagio, Tofwerk, Vaporsana), and three companies (Studer Maschinenbau, Sistag, Alpnach Norm) made repeated use of design approaches and tools.

The two unsuccessful companies stopped their innovation projects before realising absorptive capacity mainly because of two reasons: a. there was an incompatibility of values and b. these companies shied away from investing more funds in endeavours with an uncertain outcome. A systematic and holistic approach to solution finding e.g. through user research, iterative processes of concept development and prototyping was considered a waste of time, of human as well as financial resources.

[99] Contracts with designers (e.g. Alpnach Norm, Vaporsana) were dealt with in a separate document containing topics like amount of hours for commissioned design work, IPR, NDAs, etc.

While it has been reported before that many SMEs are risk averse due to limited resources, it is interesting to note that the decision against investing more resources was also caused by the cultural differences between carpenters/social pedagogues and designers/the author of this thesis. In the case of Schürmatt, designers were named arrogant and there was a clash of the notions of creativity and empathy of the two different professional groups; in the case of Schreinerei Bieri, the carpenter/CEO criticised the way functional prototypes had been manufactured (stating that "we" could have done this ourselves better).

The companies Ledagio, Tofwerk, Vaporsana socialised design knowledge but to varying degrees and with different *barriers* connected to the socialisation process. E.g. the CEO of Ledagio still uses some design tools such as prototyping or the design-driven innovation process but – at least from the perspective of the author of this thesis – did not socialise any of the new knowledge within his newly founded company. In the middle of new product development, he even went back to "silent design" not heeding the designer's advice on choice of materials or details of manufacture for the lamp, and thus, interrupting the flow of design knowledge to the supply chain.

Conversely, the CEO of Tofwerk understood design's role and place in the development process, and was able to pick up on a central element of human-centred design, namely the user perspective. However, there were two obstacles to the socialisation of new design knowledge: Engineer's focus was on the improvement of the functionality of the MS, and the OEM market usually does not allow co-branding.

In the case of Vaporsana there was resistance from one member of the production team to support the designers in building prototypes. In addition, the CEO failed to understand that the company would have to build new manufacturing skills to produce an industrial product instead of bespoke steam showers[100].

The three most successful companies in socialising design knowledge (Studer Maschinenbau, Alpnach Norm, Sistag) adopted design approaches and tools to *drive* company change and/or business strategy. Studer Maschinenbau as the most versed company in regard to design management used visualisation to transmit corporate values, organisational change and strategies to its employees. The CEO also built an organisational structure more conducive to innovation, including a design function in the innovation group. He also used human-centred design principles to drive strategy and the customer journey as an instrument to improve the overall customer experience of the company.

Sistag often re-used their design strategy and briefing. The team also signalled that they had understood that design management coordinates design throughout the company and that it was necessary to communicate to all stakeholders in an emotional (in addition to a technical) manner. The company also used the new corporate design (e.g. a

[100] At some point during product development, these three companies had more or less serious conflicts with their „knowledge complementary", meaning their design partners.

new user-centred company presentation) to train sales representatives and to actively unify the company. Finally, the product manager of Alpnach Norm included company members and the designer throughout new product development activities facilitating cross-functional teamwork. Later, the CEO explained to her sales force, in which way the sideboard differed from their regular product portfolio and that they had to alter the way they presented the new product to customers.

It can be said that some companies *used* design to improve company products but absorbed new knowledge in an erratic way. These companies "outsourced" the work to the designers and let them handle it. Others *accepted* design as a new approach or perspective on their business and initiated some form of knowledge absorption by including design approaches even if in minor ways. There were also companies that *integrated* design management to support the change in the company by altering structures, processes, teams, etc. and by familiarising more company members with design approaches, thus, creating *a shared sense of ownership* of design knowledge.

Transformation

In the Design Management Absorption Model (DMAM) *concepts and prototypes* are introduced as indicators of the realisation of RACAP. However, besides being first tangible results of the cooperation with designers they also were a prerequisite for the successful continuation of the projects as well as for the progression of design management absorption to the exploitation phase. The comparison of six out of eight companies[101] of design management knowledge absorption during transformation phase, leads to observations connected to some of the approaches central to design such as *prototyping* and *iterating* throughout design processes as part of the company's development processes. During prototyping and trough advanced prototypes, or a *pilot series* the working relationship between company members and designers was deepened and *trust* in their capabilities was built – or not.

To exemplify: Schreinerei Bieri decided to break off the project at the transformation phase although designers presented prototypes. In the designers view, this was a first step towards finding the "open-unfold-stand mechanism", thus, of an iterative process of getting closer to the solution. The company, on the other hand, considered it a waste of time and resources and the disappointment over the first not fully functional prototypes fuelled doubts whether designers would ever get any further than that.

Also the CEO of Ledagio curtailed the designer's process of product development at an early stage. The reasons as to why the CEO did so are not completely clear. The

[101] The Stiftung Schürmatt dropped out of the project during PACAP phase. Tofwerk is also not included in the companies that moved to the transformation phase but its case still is an interesting one: An engineer developed the solution for a shield picking up on some of the design criteria formulated in the briefing and breaking with the concept of an earlier attempt of a designer. Why he did so is not completely clear. Nevertheless, the engineer's minimalistic solution was more appropriate than the flashy concept relating to the product language of consumer goods of the designer.

author of this thesis assumes that he thought himself capable of developing the prototype without the help of the designers ignoring that prototypes are an important tool for designers. During evaluation interview, the CEO stated that he received many ideas how to shape future generations of the lamp from the designers; thus, reducing designing to form giving while he apparently viewed the choice of the materials, or the decisions how to manufacture the product, etc. as an engineer's work. To put it simply, unresolved questions during PACAP stages will backfire during transformation phase.

Implicitly or explicitly other conflicts between designers and companies resurfaced during transformation phase. In some of the cases they were related to the so-called socialisation of new design knowledge: While e.g. in the case of Vaporsana early 3-D renderings were used for decision-making and to move the project further, work on prototypes lagged behind because of little support or sometimes open resistance of one member of the manufacturing team towards the designers. Also the *division of labour* between company and designers was unclear.

In the Alpnach Norm case, the product manager was under a lot of time pressure because internal resources from the manufacturing team were of short supply. The generally good working relationship between the designer and the product manager was disrupted because the designer went over budget with his hours. This caused quite a stir with the CEO who accused him of behaving in the irresponsible way of an "artist"; she overlooked, though, that the agreed upon hours were not estimated correctly at the outset of the project because the designer in addition to the sideboard also developed a series of accessories.

To summarise *barriers* that hampered the first step of RACAP were the following:

- Conflicts caused by design approaches such as prototyping as an iterative, at times a slow and uncertain process of solution finding and dissatisfaction with prototypes or concepts
- Conflicts about financial resources, time schedules and use of intellectual property and companies' unwillingness to invest resources in projects with an uncertain outcome
- Conflicts because of disagreements how to manufacture a product
- Deficiencies on the side of the company such as non-existing product development or innovation processes, structures, and teams
- Doubts and distrust in the abilities of designers

In contrast, companies such as Studer Maschinenbau, most of the time Alpnach Norm and Vaporsana, or Sistag used prototypes to systematically move forward through iterations of prototyping and decision-making. In these latter cases, company members as well as designers used prototyping or visualisation to investigate issues around the development of new products or appearances. If conflicts arose they were able to confront and to solve them.

Exploitation

During exploitation phase, design management knowledge is brought to other areas besides new product development. In this action research project, all the companies that successfully developed prototypes of new products or appearances during transformation phase smoothly moved to the next stage, during which more design management knowledge was exploited throughout the company[102]. They all engaged in additional design activities to either update their brochures or search for new key visuals (Studer Maschinenbau), to develop tools for the sales representatives to communicate added value and brand values and to implement them at all company touch points (Sistag), to create a brand for a new product category and alter the POS and entry hall of the main site (Alpnach Norm), or to design a new corporate identity and updated communication media (Vaporsana).

Three of these companies went through a second process of sourcing a communication, a brand designer or photographer and had to transfer the values and criteria developed during new product development to these designers. By then, all these companies had developed a firm understanding of design management as a function that coordinates, aligns and orchestrates company touch points, thus, had acknowledged that design "is everywhere in the company" as stated by the CEO of Sistag.

The willingness to exploit design company-wide was prompted by two triggers: a. once the new product or appearance had taken on its own unique form, the gap between the new and the remaining touch points such as websites, exhibition booths, POS, etc. became evident for company members and the need to align these touch points more pressing; b. the human-centred approach of design, which translates into the customer focus of design management and which had been encapsulated in early strategies and later in customer experience strategies was considered a competitive advantage by these companies.

E.g. the CEO of Studer Maschinenbau stated that a good machine needs an equally well-designed company environment to convince customers of the quality of the product; he also said that he still uses the customer experience strategy as the main tool to develop his business further. Since most processes and structures of the companies were lean, adjustments were done in a relatively short time prompting a "new face" of the company to outsiders (e.g. Sistag, Studer Maschinenbau, or Vaporsana and Alpnach Norm at the Bale, Jan. 2012).

The refreshing of company touch points such as websites, logos, brochures or even manufacturing halls also had a positive impact on other company stakeholders further supporting the socialisation of design knowledge throughout the firm. Sistag stated that the new corporate identity had a unifying effect inside the company and

[102] We do not include Ledagio in this group because the exploitation of design management knowledge is erratic and not guided by an integral customer experience strategy.

Studer Maschinenbau even used the refurbishment of its manufacturing halls strategically to motivate the remaining employees after the lay-off of a group of colleagues.

However, all the companies that realised absorptive capacity needed more time and resources to fully implement their customer experience (CX) strategies. For these SMEs with limited resources it was not feasible to rollout a CX strategy in an orchestrated manner because there existed no separate design management functions. The CEOs filled in this role whenever they had time. Already a timely product launch proved to be a major challenge for companies (Alpnach Norm, Vaporsana); in the case of Studer Maschinenbau the new machine was there, a new website followed more than one year later because of limited time of the CEO and/or more pressing issues to deal with. Generally, it can be said that the progression of design management was at its height during exploitation phase in terms of understanding how and where design fits; in SMEs, however, full exploitation resulting in well aligned touch points is limited by the company's resources.

Outcomes

The indicator to measure *outcomes* of design management absorption progression in the DMAM has been defined as the *impact* of the process *on the resource base* or on company routines. There also needs to be a *"patterned element"*, meaning that a company needs to repeatedly apply a specific design management capability to evidence that some form of absorption has occurred.

Obviously, in the cases where ACAP was not realised no impacts on the resource base could be observed (see Schreinerei Bieri, Stiftung Schürmatt, partly also Tofwerk). On the other hand, in two cases an evident change of the resources base occurred (Studer Maschinenbau, Ledagio). The former altered its organisational structure and team composition to accommodate the company's emphasis on innovation; the latter made a change from a provider of electronic engineering services for the B2B-market to a B2C business through a spin-off.

However, while Studer Maschinenbau included a design function into its structure and innovation process to iteratively improve its products and adopted design approaches to drive business development, Ledagio used design erratically for product development but overall was heavily leaning on traditional marketing concepts to drive business development. In the case of Studer Maschinenbau the cooperation with the designer has a patterned element. Ledagio, on the other hand, is about to develop the third generation of lamps with an artist changing its approach to product development and the language of this new offering once again.[103]

In three of the cases (Sistag, Alpnach Norm, Vaporsana) it is too early to observe patterned elements of design management routines. A time lag would be necessary to more specifically assess outcomes. Nevertheless, it can be said that the companies'

[103] When interviewed the CEO called his strategy a marketing approach as distinct from a branding approach arguing that to serve multiple niches or market segments would reduce risk.

understanding of design management leaped to a new level as well as their awareness that in the future e.g. innovation processes would need to be adjusted. Taking partly into account what company members said during evaluation interviews and partly also is about to be implemented, the following *trends* can be summarised:

- In the case of Sistag, the new corporate design represents one of the most visible impacts on the resource base, since the name, the logo, etc. of the company has changed. While this could be just a new "varnish", the team reported that company members are about to get used to the change but identify with the new appearance and its international stance. The CEO also stated that he intends to include the design strategy into the business strategy to strengthen the implementation process.
- Alpnach Norm's CEO is willing to invest more human resources in future innovation projects, to sensitise company's sales representatives to communicate the advantages of the new sideboard system to customers, and to alter POS throughout all company subsidiaries to represent the company's new positioning. She intends to rejuvenate the company by encouraging employees to contribute more to innovation in the future.
- The CEO Vaporsana displayed more difficulties in altering the resource base of his company. Similarly to the Ledagio, he commissioned design to create products and appearances but did not yet adjust production processes and human resources to fit the future manufacture of a serial industrial good.

The external outcomes of design management absorption of five companies were manifold: They encompassed new or improved products, appearances, brand touch points, etc. However, to measure whether these new or improved offerings will increase competitive advantage is out of the scope of this thesis.

From an internal perspective on these companies it can be said: In three cases design management or more precisely design leadership capabilities were developed that already have or might in the future impact on the resource base of the companies (see Vaporsana, Sistag, Alpnach Norm). The CEO of Studer Maschinenbau, the most advanced company in regard to the progression of design management absorption, posits that design increased the overall innovation capability of his firm. And the Sistag team stated that the process had increased openness for change (leading to more strategic flexibility).

7 Discussion

While the emphasis of the analysis of individual company case studies and the cross-case comparison was on the question *how* far progressed the design management absorption in each company, and partly *why* some companies progressed further than others, the following *discussion* (or level 2 analysis) aims at *understanding* some of the phenomena of the cross-case comparison in more depth and at formulating *generalizable insights*. The findings of the discussion are organised in five overarching *themes* and a *typology* of three different *types* of SMEs with respect to their ability to absorb new design management knowledge.

In addition, the *critical framework* as a tool to measure design management absorption progression will be reviewed in the light of the experience of the author of this thesis; also the opinions of six design scholars, members of support programmes, or design management practitioners assessing the practical value of the model will be summarised.

Finally, the paragraphs and sections of the case study analysis, the cross-case comparison (Chapter 6), and the discussion (Chapter 7) addressing the *research questions* of this thesis are listed in a table overview (Table 32).

7.1.1 Discussion of main findings from cross-case comparison

Through a more in-depth interpretation of the results of the level 1 analysis five overarching *themes* were identified that capture generalizable insights of absorption. The themes point to *correlations* between actors and/or categories of the process of design management absorption. (Throughout this section it will be pointed to company case studies that exemplify these themes in brackets.) The research questions addressing *barriers* as well as *enablers* of absorption or capability building underpinned the level 2 analysis as well.

The five themes are introduced first and later discussed one by one:

1. Gatekeepers were acting as design champions at early stages of design management knowledge absorption. Being the "first absorbers" and at the same time the "design champions" created a tension that influenced the PACAP stages.
2. Enablers for a good transition from PACAP to RACAP were a design strategy encapsulating a perceived business opportunity and the preparation of the cooperation with an external knowledge source.

3. Similarities versus complementarities of new design management knowledge created a paradox for SMEs as well as for designers that at times would limit absorptive capacity.
4. Design capabilities were built through the use of design tools but design and design management concepts and approaches created long-term value.
5. Design management started to become a dynamic capability after design management absorption had moved into the exploitation phase and further into a next iteration of knowledge absorption.

1. Gatekeepers were acting as design champions at early stages of design management knowledge absorption. Being the "first absorbers" and at the same time the "design champions" created a tension that influenced the PACAP stages.

There was an intricate correlation between the *gatekeepers* of SMEs, the *triggers* or reasons why they took initiative, their standing in the company, and their ability to function as an *intermediary* or *design champion* between the complementary knowledge source and company members. The role of the design champion who familiarises company members with design knowledge is an established one in design management literature (Borja de Mozota, 2003b; Dumas & Mintzberg, 1989). Often design managers will take up this role or – if there exists no design management function – some other company member will have to fill in this position.

In the case of the SMEs with little or no design experience this notion, however, this posed some challenges:

- In the researched SMEs the gatekeepers were almost always CEOs (Stiftung Schürmatt, Sistag, Vaporsana, Tofwerk, Ledagio, Studermaschinenbau). In the case of Alpnach Norm the main gatekeeper was a product manager, strongly supported by the CEO. Since the CEOs were the first ones to absorb new design management knowledge, they had to advocate the value of new design knowledge at a moment when they were not fully convinced of the "four powers of design" (Borja de Mozota, 2006). This made the first steps of acquiring and assimilating new design and design management knowledge precarious ones (e.g. Stiftung Schürmatt, Schreinerei Bieri or Tofwerk).
- This tension influenced the selection of a design partner, the briefing process and the attribution of the necessary resources to do design work (e.g. Schreinerei Bieri). The gatekeeper's relationship to design and design management approaches often remained *ambivalent* until first results in the form of concepts or prototypes became visible, which often happened later, during RACAP stages (e.g. Alpnach Norm).

- If it took too long (see Schreinerei Bieri), before satisfying results became tangible or if there was too much resistance from company members (see Stiftung Schürmatt), the gatekeeper would abort a project at a too early stage and, thus, make RACAP impossible. This was acerbated by the fact of limited resources of SMEs, the use of which the gatekeeper had to legitimise (see Schreinerei Bieri).
- In an entrepreneurial organisation (Mintzberg, 1979) the personality of the gatekeeper is essential for design management knowledge to enter the company. Depending on his personal vision design and design management knowledge was relegated to a position, from which it was not able to fully contribute (see Ledagio).
- In an adhocracy (Mintzberg, 1979) the gatekeeper has less centralised power and might encounter problems at the opposite side of the spectrum. The "democratic" character of an adhocracy hampered the role as a gatekeeper introducing new design and design management approaches in the case of Tofwerk.

To summarise: To initiate the acquisition of design management knowledge it takes an external and/or internal trigger and an open-minded gatekeeper with a strategy able to share their visions about design's added value with the members of the company. Their conviction and their standing in the company are instrumental to socialise design knowledge at a later stage of knowledge absorption.

Since at early stages of ACAP the value of the new knowledge is fuzzy, the gatekeepers will have to catch a glimpse of the potential of design as a strategic resource. For this purpose, companies have to be in touch with some external knowledge source that communicates the value of design, be it a design promotion programme, a designer, a university, or some other "weak tie" (Granovetter, 1973) of a firm's network.

2. Enablers for a good transition from PACAP to RACAP were a design strategy encapsulating a perceived business opportunity and the preparation of the cooperation with an external knowledge source.

The design management absorption progression of the SMEs moved through a series of leaps of faith going from uncertainty during PACAP to more trust in the potentially good outcomes in RACAP. Successful companies in realising absorptive capacity (Studer Maschinenbau, Vaporsana, Sistag, or Alpnach Norm) clarified "how design fits" in with their overall business strategy early. They also were able to engage in cooperation with an external knowledge source and to absorb knowledge from them. So the observed enablers of design management absorption during PACAP and the preparation of the transition to RACAP were twofold:

- Scope and strategic intent: The clearer the formulation of the *scope* of a design or innovation project and the *strategic intent* connected to it, the

smoother was the acquisition and assimilation of design management knowledge (e.g. Sistag, Studer Maschinenbau, Vaporsana). The above-mentioned successful firms focused on a perceived business opportunity and encapsulated it in a *design strategy*. They also understood that later on more touch points would have to be altered to match the new product/service, etc. So they acquired the embryonic design management capability of aligning brand values throughout all touch points at an early stage (see Sistag or Studer Maschinenbau). As a result many initial strategies were further differentiated at the exploitation stage in the form of *customer experience strategies*, anticipating during PACAP objectives concerning the RACAP phases and preparing a smooth transition from PACAP to RACAP. Since SMEs rarely are split into functional silos, the gatekeepers themselves were handling touch point orchestration.

- Preparation of cooperation with a complementary knowledge source: To formulate a design strategy necessitates design leadership capabilities; for the companies this was a "tall order". To facilitate the formulation of design strategies and briefings and the selection of a suitable designer[104] a link to some external knowledge source such as design support programmes or university members introducing design management concepts was necessary (in all company cases, the author of this thesis supported to formulation of design strategies). For SMEs with little human and financial resources the best strategies as well as the most effective briefings were pragmatic and to the point (see Vaporsana, Alpnach Norm), meaning design was not presented as the panacea to all ailments of the company by facilitators or design agencies. The latter caused distrust or resistance on the side of the SME to entering a productive relationship (e.g. Schreinerei Bieri or Stiftung Schürmatt).

While a design strategy opened a window of opportunity, the formulation of a design briefing was a first act of *taking ownership* of the project and of design's place in it (see Alpnach Norm). During negotiations between the company and the designer regarding the briefing or other contractual issues, the foundations for the working relationship with the complementary knowledge source was built (Alpnach Norm, Vaporsana). Since a design briefing anticipates the outcomes of later design activities, it functions as a bridge from PACAP to RACAP.

[104] In this action research project, the University acted as external knowledge sources facilitating the first steps of knowledge absorption. In other circumstances, they would be replaced by members of design support or promotion programmes or by design agencies. However, still many smaller design agencies in Switzerland feel unprepared to formulate their contribution in strategic terms. E.g. some of the design agencies cooperating in the individual company projects appreciated the presence of a researcher/design manager as a intermediary, not only during strategy formulation but also, later, when conflicts occurred.

Limiting factors for the smooth transition from PACAP to RACAP were the lack of the above-mentioned factors or deficiencies connected to them (Stiftung Schürmatt, Schreinerei Bieri, Tofwerk). As has been laid out in the paragraphs on acquisition and assimilation of the cross-case comparison cultural differences between professional groups can further cause the breaking off of projects during PACAP (for details see the upcoming point 3).

3. Similarities versus complementarities of new design management knowledge created a paradox for SMEs as well as for designers that at times would limit absorptive capacity.

The absorptive capacity construct emphasises the fact that – according to learning theory (Cohen & Levinthal, 1990) – new knowledge needs to be *related* or *similar* to the firm's existing one to be more easily received. On the other hand, the new knowledge source needs to be *complementary* or *different* to existing knowledge to be considered as helpful for the company. The prerequisite of "similar as well as different" does contain a certain paradox, „a seemingly absurd or contradictory statement or proposition, which when investigated may prove to be well founded or true".[105]

In the case of SMEs involved in this project, the *paradox* mentioned above created a tension that some companies were more able to deal with (see Alpnach Norm or Studer Maschinenbau) than others (Ledagio, Tofwerk). If the new knowledge was only allegedly considered as too similar to the company's knowledge, it caused the breaking off of projects (see Schreinerei Bieri AG, Stiftung Schürmatt). If the new knowledge differed too much from the one of the company it was not perceived as complementary but as alien, and – again – this could cause the end of design (management) knowledge absorption (see Tofwerk).

On the other hand, design management concepts such as cross-functional teamwork during new product development or the alignment of company values across all touch points constituted a *similar* form of knowledge to the one existing in the companies; it was easily absorbed because it related to common management concepts (e.g. Vaporsana, Sistag).

Conventionally, it is the designer's task to introduce *divergent thinking* at some point of the design process. So the issue of design being *too different* will sooner or later come up. While design-experienced companies encourage divergent thinking to develop new solutions[106], for SMEs with little or no prior design experience, divergent thinking sometimes is perceived as a *transgression* (e.g. Schreinerei Bieri). In addition, the "otherness" of design triggered conflicts in areas such as deliverables, budget, etc. (Vaporsana, Alpnach Norm).[107]

[105] Oxford dictionary online, accessed July 2012
[106] New strategy concepts such as the „Blue Ocean Strategy" (Kim &Mauborgne, 2004) encourage divergent thinking as well.
[107] In the case of Alpnach Norm, the designer was accused of having an irresponsible "artist's attitude", because he went over budget towards the end of the project. What the CEO did not consider was that the designer develop a sideboard system and a series of accessories, something the board did agree to after the

As mentioned in the Oxford online dictionary, in a paradox seemingly contradictory statements can both be true, meaning new design knowledge can at the same time be similar and different and might unfold its power exactly because of that. In some cases, to become aware of the paradox or to reflect on its dynamics e.g. of different value systems of professional groups was a first step to manage the paradox and to improve the quality of cooperation between the companies and the complementary knowledge source (e.g. Alpnach Norm, Vaporsana).

Conflicts led to an improved understanding of the working process (and value system) of designers, (the rules of) cooperation between designers and the company (e.g. Alpnach Norm or Vaporsana), etc. In these cases the design manager/facilitator (sometimes in form of the author of this thesis) acted as a mediator between the known and the unknown, the similar and the different. – Solving the "paradox riddle" produced *tolerance* for the "otherness" of design or for disruptive forms of creativity.

4. Design capabilities were built through the use of design tools but companies were more affected by design and design management concepts.

In a setting of cooperation with an external knowledge source the *complementarities* of design management concepts and approaches became more tangible for the SMEs if design tools were used from the outset. As mentioned before tools such as user scenarios, customer or brand personas, customer journeys, etc. supported the exploration of business opportunities, (future) user needs, or even the formulation of strategy.

With the support of these tools *implicit knowledge* of company members such as sales representatives, engineers or product managers (e.g. Vaporsana, Alpnach Norm) was made *explicit* and company-specific knowledge was being created (Nonaka & Takeuchi, 1995). At times this knowledge took on the form of *visualisations, stories*, *analogies* or *mood boards* (Studer Maschinenbau, Vaporsana AG, Alpnach Norm) and became a point of reference for designers as well as for company members throughout the development process. So design management absorption was facilitated by the use of design tools.

While many of the eight companies remembered these tools, only a few actually re-used them within the time frame of this action research project and until evaluation interviews took place (e.g. Studer Maschinenbau). If design management capability were to be measured by the repeated use of certain tools (a capability is characterised by a patterned element), then most companies did not build design management capability.

However, what at first sight appears to be a failure of design management knowledge absorption was disputed by the more successful SMEs (e.g. Sistag or Alpnach Norm). These firms declared to have understood a series of design and design management concepts and – through those – to have learned to look at their businesses from a different perspective. The following design as well as design management concepts affected the companies the most:

briefing process had ended. On the other hand, the designer did signal rather late in the process that there was a problem coming up.

- *User-centeredness* or the capability to look at a product or service from a user's perspective; this perspective is not reserved to designers but can be employed as well by engineers, managers, etc. (e.g. Tofwerk)
- *Cross-functional teamwork* during the development of new products, services, appearances, etc. (e.g. Alpnach Norm, Vaporsana)
- *Emotionality* or making company values and strategies visible by charging touch points with meanings, colours, key-visuals, symbols, etc. (e.g. Sistag, Studer Maschinenbau)
- *Product language* or telling a story with a product and controlling what it tells (e.g. Vaporsana, Tofwerk)
- *Alignment* of company values and product language (e.g. Ledagio)
- *Orchestration* of company touch points through the adoption of an *outside-in perspective* to analyse and improve all interfaces with stakeholders (e.g. Sistag)
- *Story* and *visualisation* to drive change (Studer Maschinenbau)

While design tools encapsulate design or design management knowledge and their use leads to more awareness of the concepts behind them, capability building and the socialisation of new design knowledge underpin the whole absorption process. So new knowledge trickled into the company system in small doses; often the specific origin of the new way of thinking could not be traced back but companies acknowledged that a sense of *shared ownership* in cross-functional teams that evolved over time (e.g. Vaporsana or Studer Maschinenbau). It was also declared (Sistag) that a human-centred perspective would have a long-term effect on the company.

5. Design management started to become a dynamic capability after design management absorption had moved into the exploitation phase and further into a next iteration of knowledge absorption.

Zahra and George (2002) describe ACAP as a *dynamic capability,* if new knowledge is created and utilised to enhance the firm's ability to gain and to sustain competitive advantage. This definition implies that there needs to be an intention as to why to create and to utilise a certain new form of knowledge. While central outcomes of RACAP in our case were improved services, products, appearances, etc., an increase in innovation capability and strategic flexibility was built on the foundation of positive prior experiences with the new knowledge (e.g. Studer Maschinenbau).

As mentioned before, for most SMEs with little or no prior design experience the decision to integrate new design management knowledge constituted a leap of faith (e.g. Alpnach Norm, Vaporsana, Sistag). They first needed evidence that design "works". Once design concepts progressed to advanced prototypes in transformation phase leading to the prospect of business success, SMEs were willing to invest more resources: firstly, into a more coherent customer experience (Studer Maschinenbau, Sistag, Alpnach Norm, Vaporsana);

secondly, into possible future innovation or design projects (Studer Maschinenbau, Alpnach Norm).

Thus, the trust that design management can help to gain and sustain competitive advantage was built at the very end of the design management absorption process, during exploitation phase or beyond in a next iteration of design management absorption (e.g. Alpnach Norm). Actually, if we take Zahra and George's definition as a yardstick only one company used design management as a dynamic capability (Studer Maschinenbau).

Even though new product development can function as an "engine of renewal" (Danneels, 2002) and the improved product and/or an altered customer experience are a visible leap forward for a SME this does not yet constitute proof of ACAP as a dynamic capability. If the SMEs (e.g. Vaporsana, Alpnach Norm, Sistag) invested more resources in branding, communication media or corporate designs during exploitation phase, this might have been done with the idea to align touch points "once and for all". More pointedly one could say, after having an improved product and service, these companies might go back to business as usual.

However, to sustain the competitive advantage gained through an improved product, companies will have to initiate further innovation activities, to re-configure company resources if necessary, and maybe even to absorb more knowledge. The capability to repeatedly absorb new knowledge is the foundation for a dynamic capability. At this point in time[108], this can only be observed with Studer Maschinenbau. This company is tailoring one of their inventions to the needs of Africa for a cheap energy source by turning biomass (e.g. feces) into pellets. For this purpose the company is again using design to adapt and miniaturise the machine.

Also observed with Studer Maschinenbau, another decisive factor is a trusted relationship with a design partner (the designer today is part of the innovation team). Design by its very nature has the propensity to iterate and improve on products, services, etc. and, thus, to sustain competitive advantage. However, if the design partner is considered a function, to which design work is "outsourced" a *basic* form of design management (see Response 1) is being used. The propensity of design to innovate only becomes a valuable resource and a *dynamic capability* for a company under the condition that design management is understood as an organisational capability to drive innovation and change.

7.1.2 Typology of SMEs with little or no design experience

Based on the results of the cross-case comparison and the discussion of the results a *typology* of how companies with little or no prior design experience absorb design management knowledge can be defined. Figure 29 (see Chapter 6.2.1) supports a bird's eye view on the progression of design management absorption making two extremes of

[108] This is happening after this applied research project, though is mentioned to illustrate what is meant by point 5.

absorption visible: companies that stopped their projects during PACAP, and companies that fully realised ACAP. With these two extremes on a continuum of progression a classification or a *typology* could be defined that consists of three *types* of design management absorbers:

- *The rejecter,* who is not willing to absorb design management knowledge or rejects it as not leading to desired results.
- *The basic user,* who selectively or inconsistently makes use of design to improve products, appearances, experiences, etc.
- *The adopter,* who embraces design management as a dynamic capability.

Table 31 groups the eight companies involved in the action research project according to the types of rejecter, basic user, and adopter. Since some of the companies show characteristics of two types, they are placed between categories. While e.g. Schreinerei Bieri and Stiftung Schürmatt clearly rejected the introduction of design management knowledge in their companies, Studer Maschinenbau repeatedly used design, and design management was even able to act as a dynamic capability. Companies such as Tofwerk, which are placed in between types, might change into a basic user if market conditions allow for it, and Sistag and Alpnach Norm declared to implement more elements from their design strategy in time.

Table 31: Companies classified according to typology

Rejecter	Basic user	Adopter
Schreinerei Bieri Stiftung Schürmatt	Vaporsana Ledagio	Studer Maschinenbau
Tofwerk	Alpnach Norm Sistag	

While *the rejecter* has fundamental objections as to why not to engage in cooperation with designers or another source of design management knowledge, *the basic user* and *the adopter* absorb design management knowledge but in two quite different ways. Both the *rejecter* and the *basic user* are not able to self-assess their progression of design management absorption, which results in perception gaps of absorption as compared to the analysis of the author of this thesis.

After some initial interest, the *rejecter* decides not to get involved with design or design management. As the main barriers to design management absorption, limited financial as well as human resources, can be named. However, there are cultural or even psychological barriers such as distrust, stereotypes or different value systems of professional groups at work as described before. In the company case studies it has been observed that SMEs reject design when the knowledge is too similar ("we could do this ourselves, we do not need designers for that"). An example for this attitude is the carpenter/CEO who thought the functional prototypes of the designers were

manufactured sloppily. Or if design and design management knowledge is perceived as too alien ("this is not how we do things here").

While it cannot be expected that *the rejecter* is able to self-assess the absorption gap left after rejecting the concepts of design and design management as such, a limited understanding of design management knowledge causes the perception gap of the *basic user*. They adopt design erratically without reflecting on the full potential of realised absorptive capacity.

The *basic user* absorbs design management capabilities such as the sourcing and the commissioning of design to sporadically do what the company itself is not able to do. While companies managing design *silently* (Gorb & Dumas, 1987) are not aware of making design decisions, a *basic user* will know design's contribution but only use it for a specific purpose. Designers might be invited to provide ideas, forms and shapes, information about trends, to some degree also of customer insight but not to contribute complementary knowledge to existing business routines. The *basic user* absorbs design management concepts because they constitute a *similar* form of new knowledge and "outsources" the *complementary* one such as product language to designers.

Design is considered an external resource, which is not central to business or strategy development processes since these tasks are handled by marketing or other business functions. So for *basic users* there exists a *hierarchy* of knowledge critical to business development, innovation or new product development and design and design management knowledge is considered subordinate to e.g. marketing or engineering knowledge. This way the notion of design as the "Cinderella of strategy" (Francis, 2002) perpetuated.

Given the fact that many SMEs with little or no prior design experience do not know how to handle design, the design management knowledge absorption of the *basic user* has progressed to the stage of understanding how design "fits" in and how to ripen benefits from utilising it. However, design management knowledge only indirectly enhances a *basic user's* ability to gain and sustain competitive advantage by improving his offerings, even if over time this type extends his use of design to create a holistic customer experience.

The *adopter*, on the other hand, allows design and design management concepts and approaches to transform products, services, appearances, or experiences as well as a company's strategy, processes, structures, or culture. This type is willing to experiment with complementary design tools or approaches, even if at the outset they think them "weird". If there exists barriers to design management absorption, then mainly because of the limited resources the company has at its disposal to put the new knowledge into practice. There are no *gaps of perception of absorption progression* since design management's potential has been fully understood. Design management knowledge is perceived as an expandable resource by the adopter that – over time – will not only improve products but also increase innovation capability and strategic flexibility.

It is perceived as one driver amongst others to support the growth of the firm (Penrose, 1959) or to gain and sustain competitive advantage (Zahra & George, 2002). Design management might not be the only DC to impact on the resource base of the adopter but it is one among others because the stance of the adopter with respect to sources of knowledge is basically non-hierarchical.

This attitude is also reflected in the way he meets with the complementary character of design and design management knowledge. There is interplay between *related* and *different* or between various professions and stakeholders inside an adopter's company. Tolerance, a sense of shared ownership and "victories" within the team acts as a buffer when (too) diverging ideas are testing the patience of non-designers. To reinforce absorption and to build a company culture conducive to design a trusted and tried work relationship with one or more designers is a helpful resource. The designers do not need to be part of an organisational structure but are commissioned on a regular basis or whenever necessary[109].

The *adopter* interlinks design management, business development, or change management to an extent that makes it difficult to distinguish one from the other. One could argue that it is the nature of design and design management to apply design tools and approaches to almost any problem in need of a solution. However, the adopter has first to absorb basic design management concepts to distinguish which resource is best used to solve his problems. With a clear understanding what design and design management approaches can do for the company will enable the absorber to use them as a dynamic capability propelling the company further in terms of competitive advantage and strategic flexibility.

The contribution of the Typology of Design Management Absorbers to theory and practice will be discussed in "Conclusions" (see next Chapter 8) including a discussion on the question that one type could change into another one over time due to different circumstances such as the market situation or the team configuration.

7.1.3 Validation of Design Management Absorption Model

In this chapter the *weaknesses* and *strengths* of the DMAM as an evaluation tool are discussed based on the experience of the author of this thesis. The DMAM is based on a generic model of absorptive capacity (Cohen & Levinthal, 1990; Zahra & George, 2002) with the organisational capabilities of acquisition, assimilation, transformation and exploitation of new knowledge. While the single steps during company projects at times blurred into one another, this concept proved to be a helpful one for the analysis of absorption progression in retrospect.

[109] In the case of Studer Maschinenbau, the designer is not a formal staff member but the organisational chart contains a box for a design function in the innovation organisation.

The DMAM was not introduced at the start of company projects but later during the "specifying learning phase" of the action research cycle (see p. 132), right after evaluation of the individual company projects. The narrative version of the DMAM proved to be useful to map absorption progression with companies and to discuss disagreements on how far firms had progressed.

However, there is one element of Zahra and George's (2002) ACAP construct that we question based on our empirical data: New knowledge can be absorbed and even exploited without becoming a dynamic capability or leading to increased strategic flexibility: The case of Vaporsana shows that an improved product and even an altered corporate appearance might not be enough to prepare the company to manufacture an industrial product (see also theme 5 of the discussion).

The DMAM adapted the generic model of the innovation studies to the needs of design management by introducing *design management capabilities* connected to the steps mentioned above and *indicators* of design strategy, briefing, prototypes customer experience to enable the measurement of design management absorption progression. During the analysis of company case studies and the cross-case comparison using the model several issues emerged:

1. In the model actors of design management absorption are not explicitly denoted.
2. Socialisation as a separate phase of absorption is questionable as well as the chosen indicator for socialisation of design management knowledge.
3. The indicator of the acquisition phase, the design strategy was inaccurate.
4. The rating scores to measure design management progression could be more differentiated.

1. In the model actors of design management absorption are not explicitly denoted.

The theoretical foundations of the ACAP construct as well as the DMAM don't include the different actors that contribute and give distinction to design management absorption. The narrative version makes an attempt to visualise that absorption is being done and influenced by people in an organisational context. But even though the model adopts an organisational perspective on learning and absorbing, different kinds of stakeholders can be identified. A satisfying cooperation between these stakeholders will influence the extent, to which new design management knowledge is absorbed. Key stakeholders in design management absorption processes are: the gatekeeper, an external complementary knowledge source – be it a design partner, design facilitator, promoter or both, and company members, especially marketer, engineers, sales representatives, etc. Especially during the early stages of absorption a smooth interaction of the gatekeeper (from the company side), an external knowledge source in the form of a facilitator/consultant/senior designer acting as a trigger, and designers executing design projects is essential. This is a delicate time of the absorption process and of interaction between these stakeholders.

2. Socialisation as a separate phase of absorption is questionable as well as the chosen indicator for socialisation of design management knowledge:
As has been said before, the socialisation of new design knowledge does not constitute a phase in itself but underpins all of the absorption process. To place socialisation between PACAP and RACAP as in the narrative version of the model, nevertheless, is appropriate. PACAP can evolve in a small team but after the design briefing and during the ensuing phase of concept development and prototyping, the "gatekeeper" has to involve more company members in the development process, to introduce design partners and how they work, and to mediate if conflicts between designers and e.g. the production team arise.

However, to measure the extent of socialisation of design management absorption based on the re-use of design tools was unsatisfactory during data analysis. Most companies had not re-used tools but had understood design approaches and changed some of their views on business or processes. Socialisation of design knowledge also was the result of accepting a new player entering the game. The fewer stakeholders competed for the floor, the more a sense of shared ownership and efficiency of development processes increased. A new indicator could be, how many more company members absorbed design management knowledge. This would allow for a quantitative measurement in addition to a qualitative category such as how efficiently stakeholders collaborated during development processes.

3. The indicator of the acquisition phase, the design strategy was inaccurate:
While the indicators of design briefing, prototypes and customer experience strategy supported the measurement of absorption progression, the indicator of design strategy evokes a "professionalism", which a SME with little or no design experience does not yet possess. The variety of notions as mentioned in the cross-case comparison made evident that to formulate a design strategy and to differentiate it from business strategy at such an early stage of design management absorption is difficult. Even with a facilitator present, be it a design consultant, a design facilitator, or an experienced designer a realistic outcome of the acquisition phase is twofold: a) the discovery of a business opportunity and b) the realisation, in which way design approaches "fits" in with the company. The clearer the *opportunity* for design is outlined and put into a metaphor or analogy the better. This seems to be a more pragmatic procedure when working with a SME.

4. The rating scores to measure design management progression could be more differentiated.
During analysis of company case studies the main score of compliance with indicators was highlighted in a darker shade of blue; lighter hues were used when more differentiation was need. This allowed for a more precise analysis. On the other hand, during cross-case comparison these lighter hues to assess a company were of no additional help to analyse differences or similarities. The basic choice between three

possibilities was sharper than the more elaborated system of using lighter hues of colour. Even though the definition of "complete failure", "good enough" or "full success" of scores seems simplistic, it forces to make a clear statement.

7.1.4 Adapted Design Management Absorption Model

Based on the experience of the author of this thesis in using the Design Management Model (DMAM) as an evaluation tool the following adjustments have been made (see Figure 30, overleaf).

- Three categories of actors of design management absorption processes are introduced such as gatekeepers, external knowledge source, employees, and company members, who are involved in design projects. The key actors are listed at the bottom of the adapted model.
- The "trajectory" of new design management knowledge from acquisition to exploitation is made clearer through the use of colour. New knowledge is going from not yet specified pieces of a puzzle to a more formalised assembly e.g. in the form of a design briefing, to the embodiment in a key product, to a distributed form in single improved touch points. During exploitation phase, also additional designers might be involved. So the number of external designers increases in the visual representation of the exploitation phase.
- The descriptions of the main activities at each stage have been altered based on the findings of the individual case studies and the cross-case comparison.
- Finally, the indicator for the acquisition phase has been changed from design strategy to design opportunity and the indicator for the socialisation phase from use of design tools and approaches to shared ownership.

The adjustments have been made on the narrative version of the model because it already partly complied with the idea to relate the process to groups of people or stakeholders that have an impact on design management absorption.

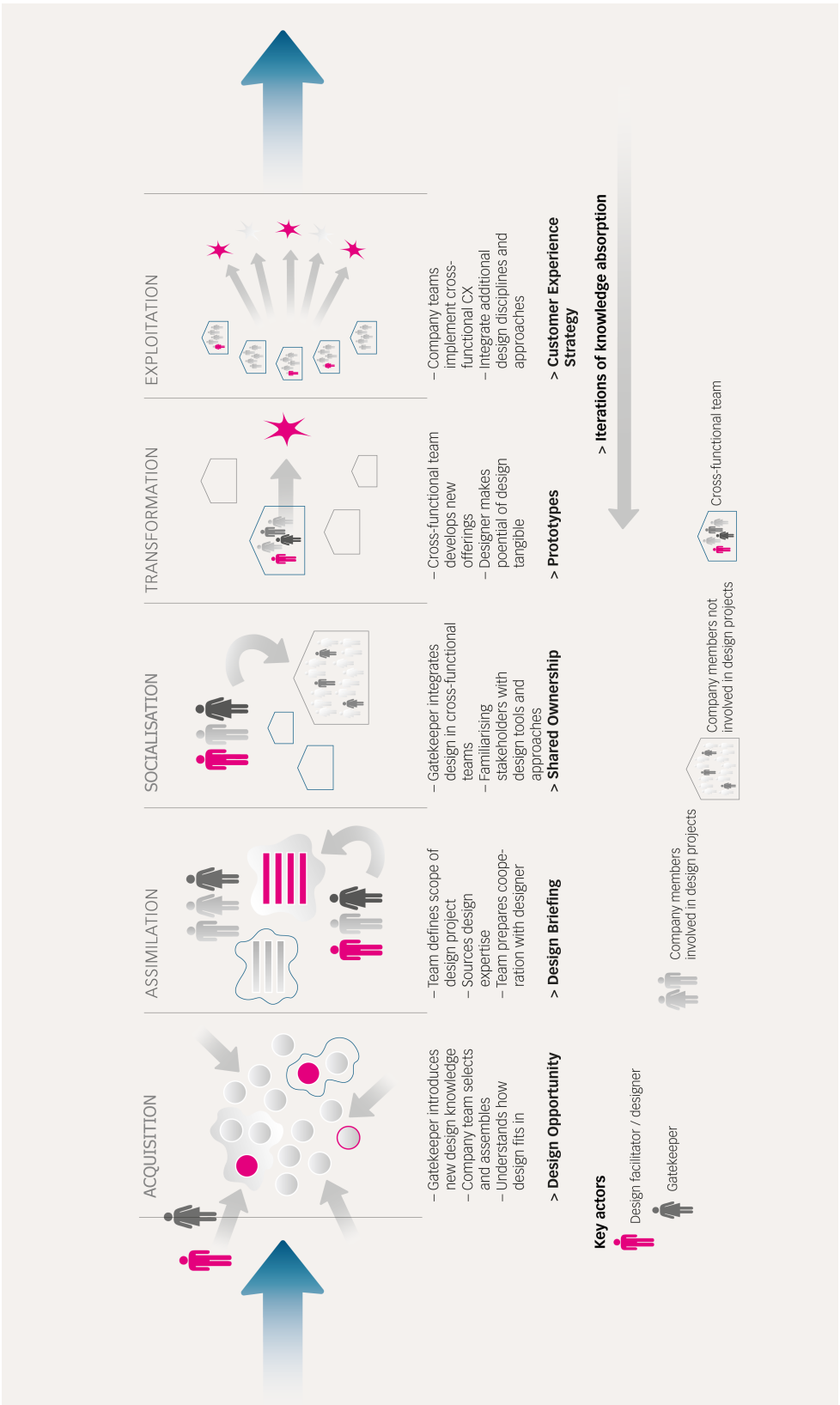

Figure 30: Adapted version of narrative Design Management Absorption Model

7.1.5 Practical value of Design Management Absorption Model

Design practitioners and scholars were sent the narrative Design Management Absorption Model by e-mail containing a short explanation of the background of the model, the steps of knowledge acquisition, and tentative recommendations on how to use it in collaboration with SMEs. Six persons responded to the e-mail: Three of them are involved in design support or business development programmes; two are design consultants from privately owned agencies, and one is a design management scholar. The following questions were asked:

1. How useful is the DMAM for designers, design managers and design facilitators (e.g. of knowledge exchange or design support programmes) working with companies with little or no prior design experience to assess and describe the absorption processes companies go through when integrating new design knowledge?
    - Is the DMAM useful to measure outcomes of design management absorption of companies with little or no prior design experience?
    - Does this analysis of design management absorption processes add anything substantial to the understanding of cooperating with SMEs with little or nor prior design experience? What?
    - Would you like to comment on the indicators and succession of absorption steps based on your personal experience or knowledge?
    - Is there an important element missing in the DMAM?
    - Could the DMAM also be used as an instrument guiding companies through the first steps of absorbing new design knowledge?
    - Is the simplified version an appropriate tool to introduce this knowledge?
    - Might there be other uses of the model?

With the exception of one person who was more sceptical of the value of the model, all considered the model useful based on the following reasons and purposes: the model would enable to *reflect* on meetings, processes, projects; *explain* the nature of design to potential clients or of otherwise "invisible" learning processes; to *discuss* with businesses how to embed design; and to *develop* new, more dynamic forms of cooperation of knowledge exchange programmes.

The main criticism was directed towards the model being too "general", not fitting the diversity of SMEs; too linear, because many processes run parallel or phases are "shuffled"; not yet self-explanatory. Most experts were not of the opinion that the model enabled the measurement of outcomes of design management absorption. However, the following target groups were mentioned as beneficiaries of the model:

designers; design facilitators (members of design support or knowledge exchange programmes); design consultants; in-house design managers.

There was disagreement on the question, whether the model would be useful for SMEs themselves: One person thought so, another thought it would be overwhelming for not experienced SMEs, and suggested that it should only be used by design professionals. One person argued that the model is only fit for companies that have more than 50 employees; one person stated that the model might be applied to large organisations as well. Three experts pointed to the fact that absorption processes do not necessarily start with a design strategy but might as well begin with a mock-up or a sketchy briefing. One expert thought the indicator for the socialisation stage, the "repeated use of tools", would not be easy to apply. The views of the six experts are summarised in a table (see Appendix A.2).

To a great extent the feedbacks mirrored the experience the author of this thesis made with the application of the model. With one exception: Five experts did not think the model would be as a suitable measurement instrument. This might have got to do with the fact that the experts received little additional information besides the model itself. So the narrative version of the DMAM would need some text together with the visualisation. Apart from that, some suggestions were included in the adaptation of the model such as the change of the two indicators of "design strategy" to "design opportunity" and "the repeated use of tools" to "a shared ownership". These feedbacks also informed the recommendations to practitioners as presented at the very end of this thesis (Chapter 8).

7.1.6 Validation of research questions

To sum up Chapter 6 and 7 (Results and Discussion), Table 32 gives an overview over the paragraphs and sections, in which the research questions were addressed.

Table 32: Validation research questions

Research question	**Sections**
What internal and/or external impulses triggered the absorption process of new design and design management knowledge?	See paragraphs "Triggers" in sections: 6.1.1.2; 6.1.2.2; 6.1.3.2; 6.1.4.2; 6.1.5.2; 6.1.6.2; 6.1.7.2; 6.1.8.2; See paragraph "Triggers" in section: 6.2.1 See theme 1 in section: 7.1.1.
What outcomes did the absorption of design and design management knowledge and the build up of design capabilities yield?	See paragraphs "Outcomes" in sections: 6.1.1.2; 6.1.2.2; 6.1.3.2; 6.1.4.2; 6.1.5.2; 6.1.6.2; 6.1.7.2; 6.1.8.2; See paragraph "Outcomes" in section: 6.2.1 See theme 5 in section: 7.1.1.
Which specific design management and leadership capabilities were developed during the absorption of new design knowledge?	Partly addressed in paragraphs "Socialisation" in sections: 6.1.1.2; 6.1.2.2; 6.1.3.2; 6.1.4.2; 6.1.5.2; 6.1.6.2; 6.1.7.2; 6.1.8.2; Also addressed paragraph "Socialisation" in section: 6.2.1; and theme 4 in section: 7.1.1.
Were there specific barriers to the design management absorption process?	Partly addressed in paragraphs "Discussion" in sections: 6.1.1.3; 6.1.2.3; 6.1.3.3; 6.1.4.3; 6.1.5.3; 6.1.6.3; 6.1.7.3; 6.1.8.3; See also paragraph "Socialisation" and "Transformation" in section: 6.2.1; and see themes 1, 2, 3 in section: 7.1.1.
Were there enablers that foster smooth design management absorption?	Partly addressed in paragraphs "Socialisation" and "Discussion" in sections: 6.1.1.2; 6.1.2.2; 6.1.3.2; 6.1.4.2; 6.1.5.2; 6.1.6.2; 6.1.7.2; 6.1.8.2; See also paragraph "Socialisation" in section: 6.2.1; and see theme 1, 2, 3 in section: 7.1.1

8 Conclusions

This final chapter links the insights of the Results (6) and the Discussion (7) Chapters with some of the reviewed theory (Chapter 2, 3, and 4) and outlines the *contributions to knowledge* of this thesis, especially of the Design Management Absorption Model and the Typology of Design Management Absorbers.

This chapter also presents *contributions to practice* in the form of *recommendations* for design facilitators of design support programmes working with SMEs with little or no prior design experience, for professional consultants, for designers, policy makers, and possibly also for design managers of bigger organisations.

This chapter further discusses *limitations* of the action research project and ends with an outlook on *future research directions* and a short *final summary*.

8.1 Contributions to knowledge

The author of this thesis identified a gap in knowledge concerning the questions of *how* exactly SMEs with little or no design experience absorb design and design management and *why* some of them are more able (and willing) to do so than others. Although there exist various concepts of e.g. design maturity (Kootstra, 2009; National Agency of Enterprise and Housing, 2003) or of design management capabilities (Chiva & Allegre, 2009; Kotler & Rath, 1984; Perks, Cooper, & Jones, 2005), these concepts are rather static.

There also exist different concepts of how to implement design in organisations such as through a design programme, a design champion, pilot projects, etc. (Borja de Mozota, 2003; Dumas & Mintzberg, 1989; Blaich & Blaich, 1993). However, these strategies do mostly apply to big organisations and, again, do not adopt a procedural view.

So the main contribution of this thesis is the conceptualisation of absorption of design management knowledge in SMEs as an organisational learning process that occurs in discrete steps of acquisition, assimilation, transformation and exploitation – with a specific indicator or milestone at each stage. This thesis proposes a specific lens on this learning process as well as a technique to reflect, analyse and plan absorption of new design management knowledge.

For this purpose a framework, the Design Management Absorption Model and a Typology of Design Management Absorbers were developed. The milestones of design opportunity, design briefing, prototypes and customer experience strategy of the DMAM, which are indicators to measure absorption progression, can also be viewed as a railing to hold on to during initial steps of embedding design in a company as a result of design management absorption. From this perspective, the Design Management Absorption Model can be valuable for scholars undertaking further research (see future

research directions) as well as for practitioners, supporting SMEs with little or no prior design experience to adopt design.

Furthermore, the theory underpinning the model establishes a connection between design management concepts and the dynamic capability construct; it actually *defines design management as a dynamic capability in its own right* if it is used as a means to change and adapt to environmental opportunities and challenges. In literature it has been criticised (Ambrosini & Bowman, 2009) that dynamic capabilities are hard to observe because they do not constitute resources in themselves but are intermediary capabilities impacting on the resource base e.g. by re-configuring existing resources.

Nevertheless, in one of the companies (Studer Maschinenbau) the impact of design management as a dynamic capability could be observed. The company adapted its innovation organisation to enable a continuous flow of innovation activities. So the DMAM might in the future prove to be a helpful tool to identify dynamic capabilities.

In addition, the results validate earlier work from design management scholars such as the ones mentioned before in this chapter as well as others such as Bruce, Cooper and Vasquez (1999) on design skills in SMEs, or Berends, Reyman, & Stultiëns (2010) on external designers in SMEs.

The author of this thesis is aware of the fact that the absorptive capacity construct is a generic one and can be applied to the integration of other forms of knowledge but – as mentioned before – this thesis offers a design-specific lens to capture essential prerequisites of design management knowledge absorption while in the making.

8.1.1 Contributions of the Design Management Absorption Model

Learning for humans as well as for organisations is a cumulative activity. New is built on prior knowledge, and creativity and innovation are often a result of interlinking the old with the new (Cohen & Levinthal, 1989). However, how companies absorb new knowledge is an inherently *complex* phenomenon, since individuals as well as teams, internal as well as external stakeholders interact in companies during absorption processes.

One contribution of the DMAM is that it acknowledges this *complexity* by offering an *integrated* view on the phenomenon embracing the perspectives of innovation (ACAP construct), strategic management (DC construct), and design management studies (concepts of design-driven innovation and design management). To our knowledge, the ACAP construct by Cohen and Levinthal (1989, 1990) and its re-contextualisation by Zahra and George (2002) have not been connected to design management concepts yet.

This cross-fertilisation adds to the understanding of how companies learn and adopt design through the lens of another (related) discipline. This integration or "interplay" has its advantages (Van de Ven & Poole, 1995):

> "It is the interplay between different perspectives that helps one gain a more comprehensive understanding of organisational life, because any one theoretical perspective invariably offers only a partial account of a complex phenomenon (Van de Ven & Pool, 1995, pp. 510-511)."

However, alternative theories need to keep their distinctness "without nullifying each other" (Van de Venn & Pool, p. 511).

So besides being *multi-disciplinary,* the DMAM is also *multi-dimensional* offering different layers of explanation of the phenomenon of design management absorption: Part of the model is a simple design management process for SMEs with little or no design experience using the indicators of design opportunity, design briefing, prototyping and customer experience strategy as essential milestones leading to improved offerings. This process lies on top of an organisational capability building process of acquisition, assimilation, transformation, and exploitation. And both processes are embedded in the broader notion of how a company adjusts to environmental and internal impulses to gain and sustain competitive advantage, which is essentially a strategic question.

Another contribution of the DMAM can be derived from the *method* of its development. According to Tsang (1997) there exist two streams in organisational theory – a *prescriptive* and a *descriptive* one. While the first one is often derived from consultant's personal experiences and not really founded on rigorous empirical research, the second one is based on academic studies but often fails to offer useful implications for practitioners. Since both approaches have their shortcomings, Tsang (1997) opts for the integration of the two.

The DMAM was the result of a literature review deducting *prescriptions* on how SMEs with little or no prior knowledge should absorb new design management knowledge. The model was inductively adapted after empirical studies and now includes insights from eight company case studies. Thus the adapted version integrates *descriptive* characteristics developed during action research of how SMEs actually do learn. Even if this sample might seem small given the sheer number of SMEs (also see 8.1.4 on Limitation and further research direction on this), the model benefited methodologically from this procedure and made it more robust[110].

Thus, the DMAM is of *practical value,* also because its narrative version uses visualisation to make a theoretical framework accessible to practitioners and to make sense of absorption and change processes (more see next chapter 8.1.3,

[110] In prior research (Acklin, 2011), an early prototype of the model was used to evaluate five SME case studies; insights from this test were integrated in the here-discussed (second) version of the model by e.g. integrating indicators and a rating scale. This has been documented in Acklin (2012). So there actually happened a double validation of models through empirical data.

Recommendations). The visualised version facilitates the navigation of complexity and the adoption of *a holistic view*, which is – to put it simply – a basic design and design management capability (see also Chapter 4.3.2. Characteristics of design-driven innovation).

8.1.2 Contribution of the Typology of Design Management Absorbers

Like any other categorisation, the *Typology of Design Management Absorbers* makes generalisations. These fall short of capturing the more subtle details of a company's propensity to learn. However, besides making a preliminary evaluation possible by reducing complexity (e.g. for practitioners), this typology also allows for a more analytical view if desired (e.g. for scholars).

In Table 33 the characteristics of the three types are fleshed out using the categories of *gap in perceived absorption*, *knowledge hierarchy*, connection of design management absorption to *business goals*, *barriers* and *enablers*, and the *impact on the resource-base* of knowledge absorption. All these categories relate in one form or other to the categories of the DMAM: A *gap in perceived absorption* is caused by an inability to reflect how far the company has progressed with respect to knowledge absorption. *Knowledge hierarchy* is an antecedent of *socialisation* indicating how willing or unwilling a company is to adopt design and design management as equal forms of knowledge. *Connection to business goals* relates to the indicator *design strategy* pointing to the extent a company taps into the potential of design and design management as a driver of value creation and change. *Enablers* and *barriers* relate to the absorption process as such, and *impact on resource base* is a measure of the success or failure of achieving dynamic capability (the ability to configure and re-configure company resources dynamically).

Table 33: Characteristics of rejecter, basic user and adopter

Category	Rejecter	Basic user	Adopter
Design management absorption	No design management absorption	Selective design management absorption	Growing design management absorption (through iterations)
Main characteristic	No use of design after stop of projects and/or breaking off of work relationship	Use of design as specialised expertise commissioned when necessary	Use of design management as a dynamic capability to gain and sustain competitive advantage
Absorption gap	Perception gaps caused by rejection of design management knowledge	Perception gaps caused (involuntarily) by a limited understanding of design management knowledge	No perception gaps of design management absorption
Knowledge hierarchy	Marketing, engineering or craftsmen's knowledge (and skills) *superior* to design and design management knowledge	Design and design management know-ledge *subordinate* to marketing or engineering knowledge	Design and design management knowledge *equal* to other knowledge sources
Connection to business goals	Design not used to achieve business goals	(External) design used to improve products, services, appearances, brands, experiences, etc.	Design approaches and tools used for business develop-ment, innovation, NPD and customer experience
Barriers	Limited resources and appetite for risks; cultural clashes; doubts about efficiency of design	Limited role of design and design management to provide holistic solutions and drive change	Limited resources to speed up the pace of adoption and change of the company
Enablers	Sensitisation to design through best practice examples of peers; facilitator to develop focus for design use	Understanding of how design "fits" in and basic knowledge of design as a family of professions	CEO filling in the role of design champion and leader; trusted relationship with designer either in-house or external
Impact on resource-base	No impact on resource base	Little impact on resource base, e.g. capability to source design expertise if necessary	Bigger impact on resource base depending on overall strategic direction and design's contribution to it

In practice, the Typology of Design Management Absorbers should be used in combination with the DMAM or as another way of navigating it. The typology allows for an assessment, which *type* of SME is more likely to absorb new design knowledge, and what conditions enable organisational learning. It implicitly describes absorption as an open-ended *liquid process*, which can be interrupted, called off, taken up again, etc. For example, a rejecter might develop into a basic user given new market conditions. An

adopter might go back to being a basic user and stop using design approaches, when a new CEO takes over[111].

In contrast to the well-know design and design management maturity models mentioned before (Kootstra, 2009; National Agency for Enterprise and Housing, 2003), the Typology of Design Management Absorbers does not intend to only position a company on a *maturity scale*; it aims at describing *how SMEs mature* through looking at them from a *learning perspective*.

In companies, on one hand, there is a *tacit* dimension to learning; it happens as a by-product of doing specific things such as collaborating in cross-functional teams or interacting with a complementary knowledge source. On the other hand, it can be an *explicit* effort of a company or a team to create new knowledge and – with it – to gain and sustain competitive advantage. In the latter case, the typology provides barriers and enablers of design management absorption, and thus can be used to diagnose roadblocks in the way of more absorption or to plan the steps ahead.

8.2 Contributions to practice

There follow *recommendations* for the collaboration between SMEs and different groups of design practitioners, which partly are based on the experience of the author of this thesis and partly are informed by the opinions of the external experts (see Chapter 7.1.5) on the practical value of the model. This chapter outlines recommendations for the use of the results and the frameworks of this thesis for the different beneficiaries; they have partly been clustered because some beneficiaries do have quite similar agendas when working with SMEs with little or no prior design experience. The beneficiaries are:

- Designers
- Design facilitators of design support programmes / consultants from design agencies
- Design policy makers
- Design managers or leaders of companies

8.2.1 Recommendations

Designers

Designers approaching SMEs with little or no design experience or being approached by them can benefit from the DMAM and the typology to assess, to reflect, guide, and plan the process of collaboration with SMEs with little or no design experience. Since

111 It has actually become apparent that design as an activity is being discarded and forgotten, the moment when the gatekeeper calls the project off or leaves (e.g. Stiftung Schürmatt).

designers at times are the ones – even if unwillingly – causing rejecters to drop out of collaboration, they are an especially interesting user group of the DMAM[112].

The following recommendations specify the mind-set designers could adopt when working with a SME. They do not mean to propose a new design process but aim at giving guidelines to support the collaboration with SMES with little or no prior design experience. Thus the recommendations put an emphasis on the quality of cooperation when they are encountering distrust, or if they work with companies, which still have to learn how to collaborate with designers.

They are formulated in a "user-specific" way, addressing designers directly with a list of steps:

- *Step 1: Find a key opportunity*. Search for a company-specific design opportunity and define a goal as precisely as possible. This could be a response to a threat from the company environment; it could also be a new way of doing things the company wants to try out. In both cases, make the outcome as clear as you can, also in monetary terms if possible. Present your work as an investment rather than a cost but don't present it as a panacea to all ailments of the company. To find the key opportunity often is not easy, so prepare before you meet the company and listen to what the owners have to say. This is the start of the collaboration.
- *Step 2: Agree on a design brief.* Build company commitment by defining clear objectives, deliverables, time schedules, budgets, use of IPR, etc. You might be satisfied with a one-sentence-briefing because it leaves space for exploration. However, this is difficult for SMEs with little or no design experience. Respect the "beginner's" need for security through a design briefing but also make the company understand that a design briefing is a living entity.
- *Step 3: Prototypes can build trust.* First concepts and prototypes are not only a tool that you use in your design process; they are instruments to build trust in the outcomes of your work. Later versions of prototypes require the involvement of other company members (such as manufacture, engineering, etc.), that's when collaboration gets real and should be intense. To exchange knowledge and opinions and to integrate views from non-designers lays the foundation for a shared ownership.
- *Step 4: Allow for collaboration to create a coherent customer experience*. Accept that more, maybe other designers than yourself, might be necessary to

[112] In Switzerland, design management concepts usually are not part of a designer's education. The author of this thesis has been working with companies that shelved their design projects because they did not believe in the results of designers (especially young ones who had just left school). This is why we would like to attach a small cautionary note to these recommendations: They have been written with the Swiss situation in mind that – at least at the moment – is not preparing design students well in regard to design management skills. They are learning these skills on the job.

provide a coherent customer experience and to improve all company touch points. Make the SME aware that this would be the next step and encourage orchestration of touch points. However, keep in mind that the company might need more time and money to realise a coherent CX.

- *At all times: Work towards a shared ownership:* Be mindful of company members learning more about design and how to handle it when interacting with you. Don't compete for the floor but allow for a productive exchange and collaboration with all the other professional groups of the company. To manage expectations helps to build trust.

Design facilitators of design support programmes / consultants from design agencies

Another group of beneficiaries of the results and frameworks of this thesis are design facilitators and consultants from design agencies approaching SMEs with little or no design experience with the intention to promote design as a strategic resource or to support these companies in making their first steps to use design. We recommend several forms to use the model during collaboration with SMEs:

- As a tool to reflect on the progression of knowledge absorption during the process and to guide it with more awareness and purpose
- As a tool to plan the steps ahead
- As a tool to evaluate and assess design management absorption processes in retrospect and to discuss pitfalls and successes

The DMAM and the typology could also be used as a tool to analyse, compare and share individual experiences of the design facilitators/consultants with one another to improve strategies and support programmes.

Design policy makers

Many European countries offer design support programmes for SMEs either in regional centres or in the form of national centres or councils with the goal amongst others to sensitise companies to design as a strategic resource. For design policy makers, the DMAM might be a useful tool to research the absorptive capacity of a bigger population of SMEs, and to come up with insights supporting decision-making in the areas of innovation or design policies or design support schemes. Even though the DMAM is qualitative in nature it also lends itself to quantitatively researching bigger numbers of SMEs e.g. to improve design support programmes.

Design managers or leaders of companies

A representative of a design support programme commenting on the DMAM was of the opinion that the model is not a suitable tool for SMEs with little or no prior design experience but a good framework to guide SMEs and, thus, should be used by

experienced design facilitators from design support programmes. The author of this thesis agrees because SMEs have to experience design management absorption first-hand before they are able to connect with the concept of design management knowledge absorption. Nevertheless, the model has been used as an evaluation tool in a study[113] assessing the progression of design thinking and customer experience management in 9 large companies, mostly from the service sector such as banking, telecommunication and insurances.

The "in-house design thinking teams" of these companies were introduced to the model when results were presented. They were interested in benchmarking their own progression of design thinking absorption as compared to the other companies. Since in large companies the topic of socialising new design and design management knowledge throughout the firm is an especially challenging issue, the DMAM was also considered useful to analyse and reflect on the absorption so far and on barriers connected to it.

Considering this experience we recommend to use the DMAM as mentioned before to assess, reflect and guide, and plan the process of design management absorption. In large companies, beneficiaries of the framework are design managers, leaders, or in-house design teams who need to familiarise other company members with design.

8.3 Limitations of results and methodology

Limiting effects on the validity of results have the following factors:
1. Shortcomings of action research methodology: Some problems and limitations of data analysis were already described in Chapter 5.6.3. Expanding on these remarks the following can be added: Action research is a collaborative research method and puts a strong emphasis on the quality of the relationship between the researcher and the researched. It needs to be non-hierarchical (democratic) and participatory. The collaboration during this project was non-hierarchical but there actually existed a *triangle relationship:* There were the CEOs and other company members that expected to learn something new but also acted as project leaders of their own innovation projects; there was the author of this thesis partly assisted by the members of Swiss Design Transfer that were perceived as experts in design management by the companies; and there were the designers that were commissioned to do the design work.

The dynamics within this triangle could take on different forms:

- Most designers accepted a division of labour between the author of this thesis (expert design manager) and themselves (executing design); they felt

[113] Acklin, C. (2011). *Massive Change. Design Thinking und Customer Experience Management bei Unternehmen des CX-Forums*. Bern: CX-Forum.

supported by an intermediary and at times were even glad that the researcher would mediate conflicts between them and the companies.

- Two designers would compete with the author of this thesis to control the project adopting the role of design managers as well. This led to tensions and put stress on the company, which had to decide whom to trust.
- The companies were taking part voluntarily in the project and were free to leave the collaboration with the author of this thesis any time; conversely, the collaboration between designers and companies was more formalised through design briefings and contracts.

While these dynamics were hard to navigate at times, they did not directly impact on the ability of the researcher to collect data and to analyse it. The reasons for the withdrawal of Stiftung Schürmatt, Schreinerei Bieri and to some extent of Ledagio were pronounced openly during evaluation talks or informal phone calls and e-mails. It can even be said that the companies breaking off the project unknowingly contributed knowledge about the reasons why some SMEs reject design.

However, because such turbulences can occur in action research it is advisable to create some distance and to test key arguments with a critical audience (Gray, 2009). In this PhD project two so-called "reflexion platforms" with colleagues of the research group and members of Swiss Design Transfer took place where the above-mentioned dynamics were discussed. One of these discussions led to the insight that there existed an ambiguity with respect to the question who exactly "controlled" the project. As stated before, the relationship between designers and companies was formal, the one between companies and the author of this thesis was not formalised (or else it might have become hierarchical). This underlying logic produced some of the above-mentioned tensions within the triangle relationship.

There could be another limitation at work: At this point in time, it cannot be said how sustainable capability building will be. SMEs with limited resources tend to use support coming from outside the company as a temporary relief from their pressing workload. This can make them "lazy" to fully absorb the concepts introduced by the researcher/facilitator and the memory might get lost once the project is over (see future research direction about this).

2. Messiness of innovation processes: The processes of the individual company projects were often messy and not following the phases proposed by the author of this thesis (see summaries of individual company processes in the Chapter 6.1 Case Studies). Since these processes were not the question under investigation, this messiness only "mildly" impacted on the research of ACAP. However, in some cases the start or the end of a specific step of ACAC as such was blurred. Also, the author of this thesis was not able to observe all the steps of the DMAM directly as already mentioned in Chapter 5.4.1 Problems and limitations with data analysis.

3. Heterogeneity: For this action research project companies were not selected based on predefined criteria such as trade, sector, professional background of company members, etc. The sole criterion was their willingness to engage with the author of this thesis and to, later, commission design work and collaborate with designers. So the sample of companies is heterogeneous and not allowing for the comparison of companies based on e.g. one sector. Besides cultural differences, which partly have been captured by Mintzberg's (1979) distinction of organisational forms, there could also be national differences e.g. caused by Swiss economic policy or environment, which have not been investigated in this study. So it might be the case that the results are not or only partly transferable to other countries.

4. Limited timeframe: The timeframe of two years for the action research project was a given by the funding agency, the Gebert Rüf Stiftung. This is a rather short period to observe ACAP. Furthermore, the resources of the author of this thesis did not allow for a simultaneous start of all eight companies projects; thus the second batch of company projects begun 9 to 12 months after the initial start. Within this time frame five companies were able to work through all of innovation process. However, to observe a fully developed customer experience and even more so *a dynamic capability* based on design management knowledge was only partly possible (see further research section about this.)

5. Limited sample: As was described in Chapter 5.2.5, 81 workshops were conducted during the action research phase of this project. This illustrates how time consuming and resource intense it is to study SMEs during absorption processes. According to Gray (2009) action research projects tend to be fairly unique and often difficult to generalise. To further validate the DMAM a bigger sample of companies would be necessary and the model might also be used in a quantitative research setting.

6. Overlapping notions: It also has been mentioned before that design leadership capabilities have a strong overlap with the strategy formations or business development skills business. This overlap of notions or of disciplines in some cases weakens the evidence for a clear cause-and-effect-relationship of design management acting as a dynamic capability. Sometimes, the new design management knowledge delivered mainly a different lens to look at the market and company challenges. It also needs to be said that design and design management are not overly essential for SMEs: Innovations such as the machine using water-jet technology (Studer Maschinenbau) is primarily an achievement of engineering and secondarily one of design.

8.4 Future research directions

The following future research directions suggest themselves based on the results and the limitations of this action research project:

1. Design management as a dynamic capability: A study to research the long-term impact of this action research project on design management capabilities, resources, competitive advantage and on the dynamic capabilities of these SMEs could shed light on the following questions: How sustainable are design management capabilities built? How and how often are they used as a dynamic capability to adapt to company challenges? – A follow-up research project would use the case study method to provide a holistic picture of the company's development with respect to outcomes and capabilities (without researchers needing to get involved as change agents).

The DMAM as a tool to identify dynamic capabilities could also be used on other samples of companies, or be refined to better describe how design management acts as a dynamic capability, e.g. by studying companies that excel at design-driven innovation. One of the research questions would then be: How can we better distinguish dynamic capabilities fuelled by design management from other company capabilities?

2. Socialisation of design management knowledge in companies: A broad socialisation of design management knowledge changes a company's culture and produces an infused state of design. A question connected to this is: Which enablers or tools improve the diffusion of design knowledge in companies – might they be small, medium-sized, or large? And how can the effectiveness of the socialisation of design management knowledge be measured? Also: How does the relationship of designers and non-designers change, if a company socialises design knowledge? – An interesting sample to study in depth with respect to these questions is are groups of large companies such as in Switzerland – big service providers such as banks, insurance companies or telecommunication providers –, which implemented design thinking programmes training non-designers.

3. The paradox of related and different: In the discussion of the results (Chapter 7.1.1.), the challenge of designers as well as of companies to handle the paradox that new design knowledge needs to be related as well as different to company knowledge was described. More qualitative research on this dynamic and balancing act could be focusing on enablers of a productive collaboration between the knowledge source and the knowledge recipient and on building mutual trust. – For this purpose, the work relationships of SMEs cooperating with designers for the first time could be observed and monitored. This project would be done without an active involvement of the researcher as a change agent with the aim to identify issues and triggers for either the development of trust or distrust between designers and SMEs.

4. Barriers to design management absorption: Even though the rejecter as described in the Typology of Design Management Absorbers does not get involved with designers or design facilitators, the rejecter nonetheless is interesting for design management research as well as the practice because this type raises the question whether the decision could have turned out differently under improved conditions. The rejection of design management knowledge absorption points to barriers that might be typical for specific populations of SMEs. Since policy makers raised building innovation capabilities as well as design capabilities as part of a broader set of innovation skills of SMEs to an economic issue, the *rejecters* might hold the key to understanding barriers.
So more qualitative research should be done on the question: What makes *rejecters* refute design as a strategic resource? What can be learned from it? How can resistance be overcome? Designers who's projects were stopped or shelved by companies could provide a suitable sample.

5. Designers as entrepreneurs: On a side note to this PhD project the issue emerged of designers strengthening the entrepreneurial stance of SMEs. SMEs, which are often short on human resources and lack staff to drive their product development or innovation activities. Business development is taking place on an ad hoc basis if at all. Designer's ability to monitor trends and bring forth ideas based on their observations was very welcome for some of the SMEs. However, at the moment there exists little theory as well as data that links design to entrepreneurial capabilities or studies how SMEs could benefit from design as an entrepreneurial activity.

8.5 Final summary

This PhD thesis studied how eight SMEs with little or no design experience absorbed new design management knowledge and how able or unable they were to benefit from it and to build design management capabilities. A critical framework was deduced from a literature review of four major building blocks and their connection to design studies, and used to evaluate eight company projects.

The level 1 analysis of the data of the action research project produced detailed descriptions of individual company case studies rating their absorption progression, and a cross-case comparison. Through ascending levels of analysis five *themes* and a *typology* of design management knowledge absorbers with the three types of *rejecters*, *basic users* and *absorbers* emerged.

In short, the findings can be summarised as follows: Four out of eight companies were able to realise absorptive capacity. One company erratically absorbed and realised absorptive capacity. Three companies stopped or interrupted the project before ACAP

could be fully realised. In one of the successful companies (Studer Maschinenbau) evidence of design management acting as a dynamic capability was observed.

Some of the barriers to design management absorption were already known such as limited financial and human resources of SMEs, cultural differences and misunderstandings between different professional groups, or the unwillingness to invest in endeavours with an uncertain outcome. However, the absorptive capacity construct adds a new way of understanding the prevalent distrust of SMEs in external designers: It can be caused by the paradox that new design knowledge needs to be related and at the same time different (or complementary) from existing knowledge. If it is too similar companies will assume that they can do without it; if it is too different it can be perceived as alien and as a transgression. Within this paradox, design management can act as a mediator between similar and different because it belongs to a related, managerial form of knowledge.

Enablers of design management absorption are a strong company gatekeeper in a position to introduce and legitimise the adoption of new design management knowledge and practices; clarity on the scope and the strategic intent of design activities and the structured start of a productive work relationship with external designers; the development of a shared ownership between designers and other members of the company such as engineers or marketers; and a predominant company culture characterised by tolerance and curiosity to learn something new.

Results as well as frameworks of this thesis might be of interest for design scholars as well as for practitioners: At this point in time, designers and designer managers often think in design, new product or innovation processes, when it comes to their work. They accept that their processes are fluid and iterative in nature. However, most designers do not pay attention to the fact that companies with little or no design experience enter a process as well – one of learning how to use and embed design.

A typical barrier of companies with little or no design experience is effective right at the start of many projects: the distrust of company members feeling uncertain about concepts and solutions proposed by the designers. However, just like a design process follows certain steps also absorption processes of SMEs unfold in specific stages, while at the same time circling back and forth between them.

To look at SMEs from a design management absorption perspective instead of a task-oriented perspective will lead to a more dynamic way of cooperation and offers the opportunity for the project partners to reflect, plan and evaluate processes and outcomes together.

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Appendices

A.1 Documentation of action research project

Table summary Stiftung Schürmatt

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Impulse	WS 1 (19 May 2010) WS 2 (21 May 2010)	- Schürmatt team (4 people) - Schürmatt's designer (external, responsible for corporate design)		- Understanding Schürmatt's positioning, environmental trends - Analysing stakeholder and customer needs and customer experience so far - Developing a key stakeholder persona - Developing an ideal customer journey for key stakeholders - Sharpening of project focus and formulation of a hypothesis for further research	- Design-driven innovation process model - DM Travel Guide - Customer persona - Stakeholder analysis framework - Customer journey - Concept of design process and definition of experience - Concepts of user research and trend scouting	- Hypothesis: "The Schürmatt is able to sustainably differentiate itself if it involves the local authorities, decision-makers and political lobbyists in a way that these can have positive experiences with the clients and the social-pedagogic competence of the employees of the Schürmatt."	- Irritations and confusion about focus of project (19 May 2010) - Negative feed-back to researchers after 1st WS (21 May 2010)

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Research	WS 3 (28 May 2010) WS 4 (6 July 2010) WS 5 (9. Nov 2010) WS 6 (10 Dec 2010) WS 7 (21 Jan 2011) WS 8 (10 March 2011)	- Schürmatt team - Schürmatt's designer	- 2 service designers during WS 3, 4, 5	- Developing plan for key stakeholder research - Briefing service designers - 10 interviews with key stakeholders conducted by service designers - Co-analysis WS about research results conducted by designers (prepared by designers) - Introducing cognitive map for sense-making (only author and CEO) - Analysing interview supported by cognitive map with team - Auditing corporate design and communication media	- Design Briefing - Mapping and brainstorming - Concepts of human-centred design and empathy, role play by service designers - Cognitive map ("Noise")	- Introduction of service designers - Detailed plan for key stakeholder research (questions, selection of key categories of stakeholders) - Design briefing (including first negotiations about possible rates) - Insights from 10 interviews key stakeholder research - Insights from communication audit	- Irritations about role play in co-analysis WS (9 Nov. 2010) - Unexpected ending of project through CEO after communication media audit (10 March 2011)
Develop	—						
Strategy	—						
Implement	—						

Table summary Ledagio

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Impulse	WS 1 (2 March 2010) WS 2 (12 March 2010)	- CEO, managing engineer ZAG - ZAG's designer (external, responsible for communi-cation and brand design)		- Analysing company's positioning, environmental trends, current brand, (future) customer needs - Discussing development of a spin-off from mother house to support positioning and marketing of new product - Analysing competitor's products - Developing of three future customer personas - Developing user scenarios - Formulating of USPs for the re-designed lamp	- Design-driven innovation process model - DM Travel Guide - Future customer persona (Two of them "extreme users") - User scenarios - Matrixes to structure analysis - Concepts of design management and product language	- USPs for redesigned lamp - Definition of innovation strategy (including dimensions of business, technology and design)	- At the start, the project is part of ZAG, an electrical engineering company - First WS take place in the presence of ZAG's external design partner for communication and brand design (who had developed a brand that is not compatible with product and had suggested "shapes")

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Research	WS 3 (16 March 2010) WS 4 (1 June 2010)	- CEO, managing engineer (WS 3) - ZAG's designer (external, responsible for communi-cation and brand design)	- Owner of product design agency (short introduc-tion during WS 3)	- Analysing the persona of the product brand - Ad hoc brainstorming of owner of product design agency how to improve product - Analysing the then current product language (WS 3) - Trend report from CEO about what he found out at several fairs he has been visiting - Market research about current product concerning user's response to it with retailers - Research on "new shapes" of the product - Discussing technological questions concerning remote control for the lamp - Defining target group for new improved lamp - Formulating briefing for product design agency (WS 4)	- Brand persona - Semantic differential - Concepts of user research - Design briefing - Sinus Milieus (market segmentation tool)	- Development of brand persona with specific values - Analysis of current product language - Identification of gap between brand and product language - Research with retailers yields result: the current lamp is too heavy for women to carry; it is too expensive - Agreement on target group for new improved lamp (upper luxury segment) - Design briefing	- Owner of product design agency joins WS 3, does not connect with researchers but erratically gives input and disappears again. - The use of the semantic differential does not yield useful results; it is heavily influenced by personal tastes and opinions of CEO. - CEO signals that things are taking too long and that he is mainly interested in receiving styling inputs for the lamp; he disconnects form and functionality. - After WS 4, CEO informs that he wants to reflect further developments of the process rather than joining more WSs

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Develop	WS 5 (28 Sept. 2010) WS 6 (22. Oct. 2010)	- CEO - Wife of CEO (WS 6)	- Product design agency (two industrial designers)	- Further steps to focus target group through product design agency - Defining of core value to be expressed by the new product ("pride") - Developing of first and then revised concepts and mock-ups by designers - Refining and detailing design and instructions for prototype	- Design briefing - Limbic map model - First concepts - Mood-boards - Mock-ups - Revised concepts	- Approval of first concepts - Choice and approval of revised concepts	- Researchers are not involved in the re-briefing process of the product design agency. Informal meeting on how to proceed with cooperation and discussion on strategy (17 September 2011) - Researchers join two meetings between CEO and product designers as observers (WSs 5, 6): The agency's product strategy goes into a different direction. - First concepts are not being understood by CEO who is not able to distinguish between concepts representing ideas and form-giving (WS 5) - The 3-D-prototyping, choice of materials and manufacture are done by the CEO with almost no involvement of industrial designers (personal communication on 25. Jan. 2012)

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Strategy		CEO	Second communication and branding agency	- Evaluating brand strategy - (Re-)naming of product lines - Market development: building network of retailers internationally and targeting hotels and boating companies - Market entry with focus on Arabic countries - New product strategy: focus on lamps as sculptures (harder to imitate)		- Spin-off Ledagio founded - Building new team (6 employees) - Adjustment of brand strategy	- Informal evaluation talk (12 July 2011) with CEO, who is already planning a new product line, this time with an artist
Implement		CEO		- Tentative launch of new product at a fair in Dubai - Start of launch in Switzerland - Re-design of information materials (brochures, etc.) - Partly re-design of website			- Moving to different address (November 2011)
Re-Design		CEO	Artist	- No re-design of lamp but planning of new (third) product line with an artist			- Personal communication during first evaluation talk (12 July 2011)

Table summary Studer Maschinenbau

Stages of process	Workshops	Team	External designers	Design activities	Tools/concepts/ approaches	Central outcome	Observations
Impulse	WS 1 (10 Sept. 10) WS 2 (1 Oct. 2010)	- CEO - Head of engineering (only WS 2)		- Analysing the company's positioning and strategy, current communication and brand - Brainstorming on new fields of application for the company's core technology (water jet) - Developing criteria to evaluate brainstorming results (including customer-driven criteria such as serviceability and meeting of user needs) - Formulating a hypothesis for the overall new direction of business development and search for new market opportunities (WS 1) - Refining the list of new fields of applications - Listing potential experts and stakeholders that might provide initial information - Listing USPs of water-jet technology - Developing main functions and potential USPs of new machines such as cleaning, peeling, cutting (WS 2)	- Design-driven process model - Brainstorming - Visualisation of brainstorming results - Matrix for the analysis of market value of ideas from brainstorming	- Decision to work on new fields of application for the machine, on the communication and brand strategy and on the organisational form of the company - Hypothesis and definition of the "hunting ground" for new product development with focus on food and animal feed sectors - Refinement of hypothesis and "hunting ground"	- At the beginning of the project, it is not on the CEO's radar that something might be off with the company's innovation organisation although he talks about problems with staff - Not purely economic or technological criteria are being developed for the evaluation of brainstorming results but also criteria concerning future customer needs
Research		CEO		- Initial research of CEO leads to focus on the cleansing of chicken as a profitable new area of application (9 billion chickens are being slaughtered each year in Europe). - CEO finds research partner (University of Zurich) to conduct tests on how to clean chicken with water-jet technology	- User research overlapping with business development	- Focus on food industry (chicken): clarification of "hunting ground" - New research partners	- After impulse WS (see above), the CEO needs no further support from researchers

Stages of process	Workshops	Team	External designers	Design activities	Tools/concepts/ approaches	Central outcome	Observations
Develop			- The company regularly cooperates with an external industrial designer	- Re-designing the current machine (cleaning cheese) including the development of a new conveyor belt and a device, which turns the cheese for the European market with the task to reduce production cost			- During WSs with researchers, CEO regularly reports on improvement of machine; the CEO and designer are a good team.
Strategy	WS 3 (8 Oct. 10) WS 4 (5 Nov. 10) WS 5 (17. Dec. 2010) WS 6 (26. Jan.11)	CEO		- Analysing organisational structure and competences of the workforce - Analysing current information media (brochures, website, video trailer on water-jet technology) - Analysing history of brand, current brand values and envisioned direction of company - Defining new brand values - Analysing touch points, identifying gaps in customer experience - Developing new brand positioning and promise - Developing communication and brand strategy and most pressing measures based on touch point analysis	- Framework "cycling worlds" of operational vs. innovation cycles - Frameworks to compare operations and innovation with different criteria - Brand persona - Brand pyramid - Customer journey	- Organisational chart of company with new structure and vacancies for employees with new competencies - Communication and brand strategy including list of measures - Touch point analysis and list of measures how to improve customer experience	- Over the run of the project, the CEO searches and finds new people with specific competences to fill the vacancies
Implement	WS 7 (20 May 2011) WS 8 (14. Nov. 2011)	CEO	- External photogra-pher	- Developing criteria for a new corporate design; choosing the right imagery for it - Shooting new images - Refurbishing of manufacturing halls and offices (new overall attribution of space, painting using corporate colours, positioning key visuals of company in entry hall)		- New image brochure including new key visuals - Completely renovated office and manufacturing space	- During this phase, the CEO has to foreclose the contract production to lay off people. The company shrinks to 12 employees. He decides to completely rely on the development and production of machinery using the water-jet technology.

Stages of process	Workshops	Team	External designers	Design activities	Tools/concepts/ approaches	Central outcome	Observations
Re-Design		CEO		- See also “development” phase (through-out the project the machine is completely re-designed in order to make it more functional, lighter in weight, more efficient and cheaper)			- When the research project is being evaluated the tests for the cleaning of chicken are still on-going; a new machine will have to be designed to fit the requirements of cleaning chicken.

Table summary Tofwerk

Stages of process	Work-shops	Team	External designer	Design activities	Tools/concepts/approaches	Central outcome	Observations
Impulse	WS 1 (11 Feb. 2011) WS 2 (17 Feb. 2011)	- CEO - Product manager - Electrical engineer		- Introducing to OEM business model - Understanding complex high-tech product - Discussing how design could fits in - Discussing first concept of a container done by external designer - Analysing corporate design and communication media (flyer, website) - Extracting core values for company and for product - Comparing company branding strategy with other high-tech firms	- Design-driven innovation process model - DM Travel Guide - Visualisation - First version of DMAM - Concepts of branding and product language	- Decision to find a new approach to branding of core technology - Decision to audit communication media of company - Working document with description and open questions how design could fit it	- First contact does not really lead anywhere; WS is ended by researchers with a question to the team what exactly they expect from the project. - Team formulates 3 questions, none of which is connected to "real" business necessities (WS 1) - After WS 2, it is still fuzzy what exactly should be done with design
Research	WS 3 (7 April 2011)	- CEO		- Analysing company touch points and brainstorming on improvements - Visual benchmark of competitor's products and analysing branding strategies - Sketching out product branding strategies by analysing the engineering prototype of MS - Developing a briefing for an acceptable container	- Customer journey - Visual benchmark - Prototype MS	- Possible measures to improve customer experience such as the development of a knowledge platform for end-users - Briefing for new container - Decision to invite external industrial designer who had developed first concept for container	- There is the intention to present the GCGCTOF with the new container at a fair in March 2012

Stages of process	Work-shops	Team	External designer	Design activities	Tools/concepts/approaches	Central outcome	Observations
Develop	WS 4 (16 May 2011)	- CEO	- Industrial designer	- Exchanging thoughts and opinions on container taking briefing and first concept of container as a starting point - Developing of a new shared briefing	- Prototype MS - Briefing summary	- Briefing summary - Decision to proceed with container project as well as knowledge platform website	- The industrial designer "defends" his first version of container; it is hard to re-open discussion with him - The project is put on hold because the relationship with OEM manufacturer turns sour (in the months after this meeting) - One of the engineers develops his own solutions (shield) for the new generation of the product, the FASTOF
Strategy							
Implement							
Re-Design							

Table summary Schreinerei Bieri

Stages of process	Workshops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations

Stages of process	Workshops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Impulse	WS 1 (10 Sept. 2010) (Preparation meeting, 15 Oct 2010)	- CEO - Sister of CEO	- Three different design agencies pitching for assignment	- Selecting designers for work assignment "easy boy" out of different competitors (10 Sept. 2010) - Preparing a prototyping WSs with different stakeholders and designers (15 Oct 2010, preparatory meeting) - Briefing designers and other WS attendants to do research on different areas and prepare for planned prototyping WS	- Concept of design process - Concept of design-driven innovation	- Designers selected - WS agenda	- Several talks between author of this thesis, brother-sister duo and other stakeholders from innovation system to clarify project and people/competencies needed (July, Oct. 2010) - Brother-sister duo agrees on cooperating with designers and selects an agency, which has a strong craftsmen background (10 Sept. 2010)
Research	WS 2 (29 Nov. 2010)	- CEO - Sister of CEO - Wife of CEO	- Two product designers - Representative of regional innovation system	- Analysing different technological solutions for opening mechanism of "easy boy" - Analysing possible structures for the product (backpack? carrying case? camping table?) - Analysing and discussing comparable products (cross-fertilisation) - Synthesising the most important insights from research	- User scenarios - Mood boards - Prints of comparable product from web research - Cardboard mock-ups - "Real", comparable products - Post-its to map insights	- Overview over possible opening mechanisms and structure of product (but no decision on which to focus yet)	- Questions about market, price, and target audience of product come up but are not discussed in depth

Stages of process	Workshops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Develop	WS 3 (4 Feb. 2011)	- CEO - Sister of CEO - Wife of CEO	- Two product designers	- Discussing two functional prototypes developed by designers - Brainstorming on how to improve them - Discussing on functionality and features of product - Working on target groups and developing two different customer personas	- Prototypes - Future customer personas	- Decision to clarify opening mechanism - Market segmentation through two distinct personas	- At the end of WS, CEO states that prototyping had proceeded further than his original idea - Brother-sister duo surprisingly stop the collaboration with designers for the time being and decide to proceed to work on the opening mechanism by themselves (e-mail communication, Feb. 2011)

Stages of process	Workshops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Strategy	WS 4 (18 March 2011)	- CEO - Sister of CEO - Wife of CEO		- Brainstorming and discussing business model categories for commercialisation of new product - Discussing market potential and next steps	- Business model canvas categories[114]	- A sketchy business model and a first understanding of financial implications concerning the future product	- Author of thesis is being informed that the brother-sister duo is looking for a manufacturer to produce ready-made solution (End of June 2011) - A simplified product idea is developed that reduces production cost and market price (evaluation, 2 March 2012) - The brother-sister-duo is developing a business plan to apply for government funding (evaluation, 2 March 2012)
Implement							
Re-Design							

[114] Osterwalder, A., & Pigneur, Y. (2010). *Business Model Generation*. Hoboken, New Jersey: John Wiley & Sons Ltd.

Table summary Sistag

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/ approaches	Central outcome	Observations
Impulse	WS 1 (19 March 2010) WS 2 (26 March 2010)	- CEO, COO, Head of Marketing		- Analysing the company's positioning, environmental trends, use of design - Developing company visions and identifying potential for innovation - Competitor analysis using price and quality (also of product language) as evaluation categories; differentia-ting different dimensions of quality - Analysing current brand architecture - Developing a brand persona for Wey (then current product brand) and Sistag (then current company brand) - Brainstorming on new fields of application for Sistag technology	- DM Travel Guide - Design-driven innovation model - Headline method - Brand personas - Mapping and visualisation - Concept of product language - Concept of design management - Introduction of different dimensions of quality, based on Garvin, 1984)	- Decision to strengthen communication of product values on market - Decision to work on unclear brand architecture - Decision to rethink business strategy based by brainstorming about new fields of application of Sistag technology	- The question how Sistag is positioned reveals that the company has not been analysing their competitors lately - The concept of product language does not trigger any noteworthy interest. Sistag's team does not consider the concept a part of a potential design strategy to enhance market positioning. Nevertheless they agree to discuss it further at their showroom with the physical products present.

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/ approaches	Central outcome	Observations
Research	WS 3 (6 April 2010) WS 4 (4 June 2010)	- CEO, COO, Head of Marketing		- Discussing product language of existing product at Sistag's showroom - Concretising fields of a design (innovation) strategy; formulating focal points - Discussing a position paper of a MA student to improve product language and brand coherence - Detailing project work and work packages	- Discussion in front of "real" products - Position paper of MA student	- Innovation hypothesis (design strategy) entailing to "inverse" brand architecture, build a service organisation to sell and promote Sistag products and improve customer experience, and to unify communication at all company touch points	- MA student visits Sistag and develops a position paper on product language and brand so far - The discussion around the position paper prompts (again) the opinion of the CEO that product language is secondary for industrial products such as valves - The intense discussion about the Sistag vs. Wey brand points to a latent conflict between the family owners and the mostly non-family management team

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/ approaches	Central outcome	Observations
Develop	WS 8 (15 Dec 2010) WS 9 (19 Jan 2011) WS 10 (9 Feb 2011) WS 11 (18 March 2011)	- CEO, COO, Head of Marketing	- Pitch of 4 design agencies (15 Dec 2010) - New design agency specialised in branding and corporate design (9 Feb, 18 March 2011)	- 4 Design agency pitches (15 Dec 2010) - Taking final decision on the new design agency (19 Jan 2011) - Reworking design briefing (19 Jan 2011) - Introducing new design agency to work done and to design briefing (9 Feb 2011) - In-depth analysis of customer journey together with new design agency (18 March 2011)	- Customer journey - Design briefing	- Finalised design briefing - Finalise customer journey	- Attention: In the Sistag case, the strategy phase is prior to the development phase! - One year passes by between the briefing of the new design agency and the discussion of their concepts (see implementation phase)
Strategy	WS 5 (28 June 2010) WS 6 (27 Sept 2010) WS 7 (27 Oct 2010)	- CEO, COO, Head of Marketing		- Rethinking the brand architecture - Reflecting implications of a changed brand architecture on corporate design - Discussing implications of change in brand and corporate in regard to implementation, etc. - Discussing of the “right” brand for all subsidiaries of Sistag - Developing two different concepts of the future corporate design to be discussed with advisory board - Audit by researchers of communication media - Audit of company touch points through a customer journey perspective	- Concept of company, umbrella or product brand - Concepts of corporate design - Concepts of design management - Audit of communication and marketing media (including concepts such as key visuals to represent company values, etc.) - Customer journey - Design briefing - Concepts of design management (the handling of design briefings)	- First draft of design briefing - Decision on finding new design agency	- The Sistag team often discusses in a controversial and extended manner about claims, corporate colours, brand architecture, values, etc. (three WS are used to align opinions, different value systems and strategy) - During one of these WS, the CEO who represents the owner family prompts his personal concept of the new brand - In a condensed form the business strategy becomes part of the design briefing

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/ approaches	Central outcome	Observations
Implement	WS 12 (8 Feb 2012)	- COO, Head of Marketing		- Auditing proposals of design agency for new brand architecture, logo, website, key visuals, etc. (without new design agency) - Discussing how to proceed with development of new service organisation	- Corporate design concepts	- Comments on new corporate design concepts	- Mid April 2012 launch of new corporate design and brand strategy
Re-Design							

Table summary Vaporsana

Stages of process	Workshops	Team	External designers / other stakeholders	Design activities	Tools/concepts/approaches	Central outcome	Observations
Impulse	WS 1 (23 Feb. 2010) WS 2 (26 Feb 2010)	- Owner family including son (CEO), father and mother; technical manager (not a family member)	- Design agency (designer/engineer and industrial designer)	- Analysing company context, trends, competitors, current customers and design use - Developing current and future customer personas, identifying gap - Developing current and future user scenarios - Developing an innovation hypothesis - Analysing product language of competitor's and own product; identifying gap - Introducing user and context research and selecting appropriate methods for the research of Vaporsana's customers	- DM Travel Guide - Design driven innovation model - Customer personas - User scenarios - Design management concepts of alignment - Mapping and visualisation methods - Concept of product language - Product language persona	- Innovation hypothesis (in this case the definition of a market opportunity) - Division of work between designers and CEO of Vaporsana for context, customer and market research as well as for technical analysis of product	- Between WS 2 and 3 designers develop an offer including the amount of hours for their assignment

Stages of process	Workshops	Team	External designers / other stakeholders	Design activities	Tools/concepts/approaches	Central outcome	Observations
Research	WS 3 (12 March 2010) WS 4 (7 May 2010)	- Owner family including son (CEO), father and mother	- Design agency - Representative of new regional policy programme (7 May 2010)	- Discussing results of different research activities by designers - Discussing implications of first research results for overall project (12 March 2010) - Designers develop a feasibility study on how to improve the shower technically, production-wise and aesthetically - Investigation in new materials for the shower and technologies to produce steam - Discussing study, which proposes a reduction of parts of the shower by 35%, an overall reduction of costs of production and installation by 20-30%, a modernisation of product language and product details	- Experiential research by designers - Analysis of photos of already installed showers (context analysis) - Questionnaire for customer research - Visual benchmark of competitor products	- Proposal resulting from feasibility study by designers including 3 steps - Ok for step 1 of work assignment (improvement of effectiveness to produce steam) by CEO	- The CEO clarifies feasibility to receive government funding from NRP; he starts writing an application with a government representative and building a network of possible suppliers from the region. - On 24 August 2010, in an extra meeting the first NRP proposal is being discussed, which intends to establish a regional supply chain network for the future steam shower - CEO develops idea for a business alliance with a Zurich-based company selling products in the same sector as Vaporsana.

Stages of process	Workshops	Team	External designers / other stakeholders	Design activities	Tools/concepts/approaches	Central outcome	Observations
Develop	WS 6 (17 Nov 2010) WS 9 (25 March 2011) WS 12 (5 Aug. 2011)	- Owner family including son (CEO), father and mother	- Design agency - Physicist, temporary collaborator of agency (25 March 2011)	- Discussing implications of innovating in a network setting (which partners are able to solve technical and design problems?) - Designers include a physicist to enhance effectiveness of steam production - Time planning for product development - Time planning for marketing and branding activities - Technical tests at the company site - Discussing several variations of how to improve steam production - Discussing values to be expressed in product language - Discussing brand and brand architecture - Discussing first design proposals of the steam shower	- Design driven innovation process model - Roadmap - Test plant at company site - Mood boards - Framework on drivers of design driven innovation - Visualisations and mock-ups - Branding concepts	- Time planning/roadmap product development and marketing - Decision on one variation to improve steam effectiveness - Decision on values to be expressed through product language - Decision to re-design some of the construction as proposed by design (5 Aug. 2011)	- Discussion of potential alliance with business partner and first preliminary decision for it (17 Nov. 2010) - Mediation of conflict between designers and CEO by member of Swiss Design Transfer on intellectual property rights and financial conditions (March 2011) - Plan to fuse companies influences discussions on brand and brand architecture (25 March 2011), see strategy phase

Stages of process	Workshops	Team	External designers / other stakeholders	Design activities	Tools/concepts/approaches	Central outcome	Observations
Strategy	WS 5 (15 Oct. 2010) WS 7 (20 Jan. 2011) WS 8 (4 March 2011) WS 10 (25 May 2011)	- Owner family including son (CEO), father and mother	- CEO potential business alliance (20 Jan 2011) - Marketing manager of potential business alliance (4 March, 25 May 2011)	- Discussing potential business alliance with owner family (pros and cons, 15 Oct. 2010) - Definition of market segmentation through three personas (20 Jan. 2011) - Developing a customer journey using the perspective of the three personas (20 Jan. 2011) - Discussing a brand and corporate design concept developed by marketing manager of potential business partner (4 March) - Discussing new business model of alliance (25 May 2011)	- Future customer personas - Customer journey - Business canvas of Osterwalder & Pigneur, 2010	- Decision to cooperate (CEO and partner CEO) - Agreement on future customer personas and the concept of mass customisation to individualise the products	- Potential business partner and marketing manager bring in their ideas how marketing communication of the two fused firms should look like. Concepts are "flawed" using "inappropriate" brand architecture and visual communication. - Because of confusion on future orientation of alliance it is decided to work on business model on (25 May 2011)
Implement	WS 11 (7 June 2011) WS 13 (30 Aug. 2011) WS 14 (22 Nov 2011) WS 15 (29 March 2012)	- CEO (owner family)	- CEO potential business alliance (7 June 2011) - Marketing manager of potential business partner (7 June, 22 Nov 2011) - Pitches of three external communication agencies (22 Nov 2011)	- Developing communication and brand strategy for the fused company; discussing how to handle respective identities (7 June 2011) - Auditing homepage, brochures, etc., brand, and alignment of values between corporate design and new shower (30 Aug. 2011) - Sourcing new communication agency (22 Nov. 2011) - Analysing first proposals for revised corporate design and brand of new communication agency (29 March 2012)	- Design briefing - Brand persona	- Shared design briefing for the communication media of fused company - Selection of new communication agency and commission of work on corporate design	Since the CEO of Vaporsana is sick, the WS is dominated by the potential business partner (7 June 2011) - After valuation of companies, CEOs decide not to merge but to cooperate in some areas (5 August 2011) - Introduction of several communication design agencies in October 2011 (in Nov. three of them are pitching)

Stages of process	Workshops	Team	External designers / other stakeholders	Design activities	Tools/concepts/approaches	Central outcome	Observations
Re-Design	Presentation of product at fair in Basel (15 Jan 2012)		- Industrial design agency - New communication agency	- Since January, fixing several technical problems of steam shower through designers - Adapting corporate design and communication media			- In January, the product is not quite finished; the new corporate design, website, brochures are being done after the presentation; launch is imminent.

Table summary Alpnach Norm

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Impulse	WS 1 (10 Feb. 2011) WS 2 (17 Feb 2011)	- CEO; product manager	- Product designer	- Analysing positioning, market opportunities, challenges and current use of design - Developing a vision of the new product consistent with history and core competency of company - Using future customer personas to identify new market opportunities - Getting an overview over history of sideboards - Refining user scenarios	- Design-driven innovation process - DM Travel Guide - Future customer persona - User scenarios - Framework Design-driven Innovation - Personal references of WS attendants of cherished sideboards - Template for design briefings	- Summary including "sketchy" design strategy for company positioning and with strategic intent to expand scope of current customers to include younger ones - A "sketchy" product strategy for new product line	- Two WS are very lively and productive with a CEO who seemed to be distracted by too much other work and a keen young product manager who was very committed - WS also offered opportunity to designer to get to know company (at that point design work had not been formally commissioned yet)

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Research	WS 3 (11 March 2011) WS 4 (5 April 2011)	- Product manager	- Product designer (11 March 2011)	- Revising design briefing formulated by product manager based on results of first WSs - Developing a plan for user research and research with the sales representatives (mixture of interviews and ethnographic observations at people's homes) - Research conducted in a restricted way because of time constraints	- Concepts of user research - Mood boards - Templates for contracts with designers	- Design briefing - Template contract with designer	- Product designer states that he feels a bit "trapped" by briefing and expresses hope to be able to fulfil expectations - Process of briefing and contracting takes up some space. Company is insecure how to handle the collaboration and seeks advice from the researchers and from Swiss Design Transfer.

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Develop	WS 5 (22 June 2011) WS 6 (3 Aug. 2011) WS 7 (27 Sept. 2011)	- Product manager (all WSs) - CEO (22. June, 3 Oct. 2011) - Head of production (27 Sept. 2011) - Head of sales (27 Sept. 2011)	- Product designer	- Discussing first concepts tackling problem to stay close to core competency of company as well as to develop a genuinely designed product - Designer presents idea of accessories to give added value to product and to signal product use (e.g. lamp manufactured by local glassblower) - Discussing card board mock-ups in original dimensions - Developing prototypes of sideboard and accessories; selecting materials and surfaces	- User research - First concepts - Mock-ups - Samples of possible materials - Prototypes - Mock-ups of accessories - Sketches and blueprints - Brainstorming	- Few customer insights - First concepts of construction of a modular sideboard system bound together by rack - First concepts of four different accessories - Detailed designs and prototypes - Decisions on materialisation and concretisation of lamp or other accessories	- Product designer works systematically as well as imaginatively on product. Represents “typical” design quality of divergent thinking. Product manager acts as “counter part” stressing converging dimensions of work (technical feasibility, time and budget) - CEO is often absent during the development phase. - Designer lags behind time schedule; company lacks time resources to fully drive project, which puts a lot of strain on product manager

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Strategy	WS 8 (3 Oct. 2011)	- Product manager, CEO, Head of sales	- Product designer	- Analysing current and envisioned brand and identifying gap - Discussing brand architecture and naming of new product - Discussing commercialisation (pricing) - Analysing sales channels - Revising project plan to be ready for exhibition in January 2012	- Brand persona - Concepts of branding	- Decision that the new product brand should not impinge on current company brand	

Stages of process	Work-shops	Team	External designers	Design activities	Tools/concepts/approaches	Central outcome	Observations
Implement	WS 9 (27 Oct. 2011) WS 10 (19 Nov. 2011) Presenta-tion at fair in Basel (15 Jan 2012) WS 11 (27 Jan. 2012) WS 12 (15 March, morning) WS 13 (3 April 2012)	- Product manager; CEO (27 Jan., 15 March, 3 April 2012) - Head of sales (15 March 2012, morning)	- Product designer (19 Nov. 2011, 27 Jan. 2012) - Brand designer (19 Nov. 2011)	- Discussing time frame to present pilot series at fair in Basel - Developing a product category brand to be introduced in current brand architecture (AN plus) - Preparing exhibition and presenting pilot series at fair - Developing a communication and customer experience strategy for launch of product - Reviewing internal processes and structure in view of future innovation organisation	- Project plan - Customer personas and user scenarios - Visualisation of brand architecture - Customer journey - Analysis tool for innovation organisation	- Pilot series - Exhibition at fair - Communication strategy - Focal points of a customer experience strategy - Focal points to optimise innovation organisation of the company	- Before exhibition at fair, conflict between designer and company because designer goes over budget. - The product is well received. - De-briefing of designer that also is being used as a means to address budget issue to find a suitable solution
Re-Design	WS 12 (15 March 2012)	- CEO, product manager	- Product designer - Expert team	- Getting feedback and input from external experts for the new sideboard system - Improvement of several technical aspects and of accessories (since March 2012)	- Pilot series		

A.2 Summary of expert opinions

Table summary of expert opinions on practical value of Design Management Absorption Model

Usefulness of model...	
To assess and describe	- Model raises awareness that process and outcomes need to be intertwined (in consulting processes) - Model useful for business development of support programmes and for designers to explain product development process to potential clients - Useful to explain an otherwise invisible process - Useful to „reflect"; however, tool is too general and linear to drive and guide operations; SMEs are too diverse - Useful to discuss with a business how to get to know and use design more effectively - Model could have value to develop models for knowledge exchange that move towards collaboration and co-creation
To guide first steps and introduce knowledge	- SMEs don't need to see model; content might be overwhelming - Suitable tool for design professionals or in-house design managers - Could be used in SMEs but also in bigger organisations - Useful tool to guide SMEs - Yes, but there still might be resistance; the question is, how to break it - Useful but there needs to be more information for designers to use it - Maybe - Good start but would have to be compared to other models
To enhance understanding of cooperation	- Raises awareness of the importance of briefings - Model proposes a clear understanding of different roles in a design process; supports SMEs to integrate design thinking - Model stresses the necessity to connect SMEs to external designers and to distribute knowledge across stakeholders - Model creates categories that are helpful to navigate the mist of business support but cannot bluntly be applied to average SME - Adds to a more dynamic concept of learning
To measure outcomes	- Outcomes would probably be different with respect to design implementation for each company - Model is not a measurement tool but a methodology for a consulting process - Only if criteria are more explicit - Useful but would need to know more
Form of the model...	
Indicators	- A design briefing or pilot project can come before the design strategy (as in acquisition); rating scale could be more differentiated - The indicator of "repeated use of design tool" is not satisfying because tool might mean very different things to different companies and might be used differently
Succession of stages	- Is socialisation in the right place? Should it also be in steps 3 and 4? - It is often difficult to create a full design strategy at the beginning of a process - Model is imposing the linearity of the design process; steps often run parallel or shuffled - Socialisation is the most critical stage because connected to culture of

	organisation and people that interact
Missing elements	- How could it be integrated in development/design process? - A time scale - Probably more is needed than just the integration of designers (because absorption processes move towards organisational psychology and behaviour)

A.3 Relevant Papers

This is a collection of papers connected to this PhD thesis:
a) The first few papers include some of the frameworks and theory from prior research that contributed to the foundations of this thesis (Papers 1, 2)
b) Later papers were written parallel to the development of of this PhD thesis or directly refer to its frameworks and results (Papers 3, 4, 5, 6).

Paper 1: Conference "focused", Berne, 2008
Acklin, C., & Hugentobler, H. (2008). *Design management for small and medium-sized enterprises: development of a design management guide for the use of design and design management within corporate R&D and decision-making processes.* Paper presented at the conference "focused" of the Swiss Design Network, Bern.

Paper 2: DMI Journal 2010
Acklin, C. (2010). Design-driven Innovation Process Model. *Design Management Journal,* 5(1), 50–60.

Paper 3: Conference Nordes, Helsinki, 2011
Acklin, C. (2011). *The absorption of design management capabilities in SMEs with little or no prior design experience*. Proceedings Nordes 2011: Making Design Matter, Helsinki, Finland.

Paper 4: 1st Cambridge Academic Design Management Conference, Cambridge, 2011
Acklin, C. (2011). *Design Management Absorption Model – A Framework to describe the absorption process of design knowledge by SMEs with little or no prior design Experience.* Paper presented at the 1st Cambridge Academic Design Management Conference, Cambridge.

Paper 5: Journal of Creativity and Innovation Management, 2013 (in print)
Acklin, C. (2012). Design Management Absorption Model – A framework to describe and measure the absorption process of design knowledge by SMEs with little or no prior design experience.

Paper 6: European Academy of Design, Copenhagen, 2013 (in print)
Acklin, C., Cruickshank, L., & Evans, M. (2012). *Challenges of introducing new design and design management knowledge into the innovation activities of SMEs with little or no prior design experience*

Design management for Small and Medium-Sized Enterprises: Development of a Design Management Guide for the Use of Design and Design Management within Corporate R&D and Decision-Making Processes

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Abstract:
In 2005, the Cox-Review (Cox 2005) identified barriers to innovation as well as obstacles to the use of design for Small and Medium-sized Enterprises (SMEs). It proposed design support to help companies use design in order to strengthen their innovation capabilities and competitiveness. Current design support focuses on design projects, advice or endorsements. Recent proposals favor a more strategic approach (Boult 2006). They suggest providing the thinking tools for integrating design into strategic R&D and decision-making processes, which requires framing design at the level of design management.
However, research shows that current design support tools and methods are not sufficiently suited for supporting companies to adopt design on a managerial level. Tools and methods are either too general (e.g. SWOT analysis) or limited to a certain phase of an adoption process (e.g. auditing design capability, Design Atlas 2000); they support rather specific areas and target groups (e.g. entrepreneurs, new product and service development) or are proprietary (e.g. "Matchbox", Design Council 2006). Furthermore, they do not connect with specific implicit or explicit concepts of design that guide design decisions. According to the maturity scale model of the Danish Design Centre, these concepts can be mapped onto design maturity scales, ranging from non-design to design as styling, design as process and to design as innovation (Design Staircase® 2001).
Design support should help companies adopt design in relation to their actual understanding and practice of design. Therefore it seems reasonable to develop a guide for the integration of design and design management according to maturity levels. The method is to put design-related questions of the participating firms at the beginning of the research process and to help these firms develop individual implementation scenarios that fit their specific situations. These scenarios then contribute to the development of a Design Management guide (DM-guide), using the maturity scale model as a structuring method. The outcome is a visual orientation device. Similar to a map, it offers routes and success factors that enable the adoption of design and design management. Further research should test the DM-guide and refine it. This will be done through "Swiss Design Transfer", a University spin-off and private public partnership.

Keywords: Design Management, Design Support, Decision Making, Design Integration, Small and Medium-sized Enterprises, SMEs, Innovation

Overview:

1. Framing the context: innovation system of Central Switzerland
2. Identifying the gap: facilitating design integration
3. Research plan: goals, process and methods

1. Framing the context: innovation system of Central Switzerland

Central Switzerland is home of many SMEs. The project "RISforCCH" (Wolf, Schweikert, Küchler, Stössel 2005), undertaken by Lucerne University of Applied Sciences and Arts – School of Business, identified typical patterns of innovation capability. While the majority of the most innovative SMEs give recognition to aspects of design management in their innovation processes, most of the others lack attention to factors relevant to design management, e.g. early inclusion of all relevant stakeholders in the product development process, and appreciation for creativity and innovation capabilities of all members of the company.
Projects such as "RISforCCH" are aimed at increasing the innovativeness of regional SMEs by either intensifying cooperation with the University or with all relevant actors of the regional innovation system.
A recent research project on design management undertaken by Lucerne University of Applied Sciences and Art – School of Art and Design, revealed the necessity of design support within the regional innovation system (Acklin, Stalder, Wolf 2006).

2. Identifying the gap: facilitating design integration

Insights on current design support modi, trends in design support policies, the limitations of current tools, and further insight that existing tools do not relate to design maturity scales, reveal a gap in tool-innovation. Therefore the envisaged DM-guide should fulfill the objective of supporting SMEs to raise their design maturity level by helping them assess their design capability and recommending specific steps towards realizing the full potential of design integration at their current or next level.

3. Research plan: goals, process and methods

3.1. Research consortium

The research consortium consists of the core research team (a professor, a lecturer, a graphic designer and an assistant from the School of Art and Design) and an extended research team (a professor and a researcher from the School of Business). Six SMEs are participating in the research project. Their profile regarding the use of design can be mapped on a continuum ranging from very little design to an advanced use of design. All research partners are manufacturing companies.

3.2. Economic goals

The economic goal of the research project is to strengthen the innovation capabilities of each participating SME through design management in order to achieve a sustained increase in competitiveness and profitability. The project does not aim to establish a direct cause-impact relationship in monetary terms. However it is argued that measurability can be assumed if the process resulting from the project leads to sustained change at the levels of strategy, brand, culture/identity, product or process.
Based on this general goal, the SMEs each work towards their own individual goals, which emanate from specific questions related to five areas as provided by the Design Atlas audit tool that are to be improved by means of design and design management.

3.3. Scientific goals

The project aims at developing a guide that can be used by SMEs regardless of economic sector and size. The research consortium will collaboratively work out individual design integration scenarios based on individual situations and questions of the participating SMEs. It will also analyze individual corporate contexts in order to find patterns, leading to a generalization of design integration scenarios to be used for the formulation of the DM-guide.

3.4. Process

The development of the DM-guide follows a 3-step process that employs a variety of formats and methods.

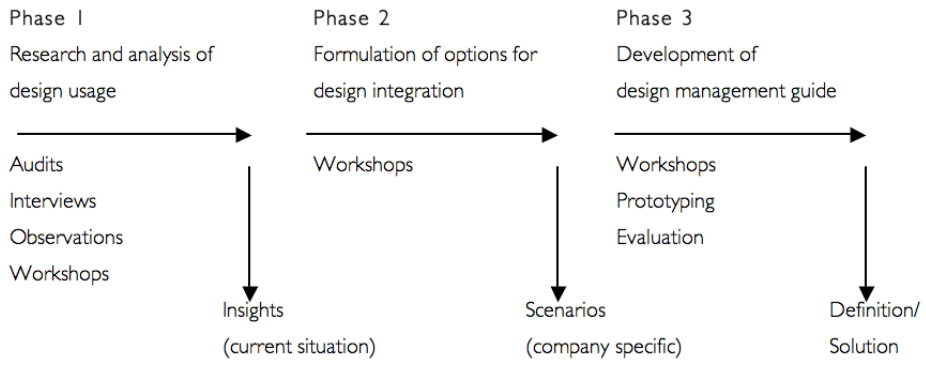


Fig 2: Research process, main methods and results

3.5. Methods

In phases 1 and 2 of the research process, methods widely adopted within consulting settings were used, such as audits, interviews, workshops and observations. Three tools were selected on the basis of being

helpful to frame a design-related context and to stimulate interaction between the research team and the companies' senior management teams:

– The Design Staircase® from the Danish Design Centre (Design Staircase 2001)

– The Design Atlas from the British Design Council (Design Atlas 2000)

– The Design Management Framework (DM-Framework) from the Design Management International program at Lucerne University of Applied Sciences and Arts – School of Art and Design (Acklin 2007)

3.5.1. Design Staircase

"In 2001, the Danish Design Centre developed the Design Staircase® to measure the companies' use of design. The basic notion of the Design Staircase® is that companies may work with design on several levels or steps, depending on circumstances. Higher positions on the Design Staircase® are correlated with positive effects on gross result growth as well as distinct positive effects on export ratios" (Design Staircase 2001).

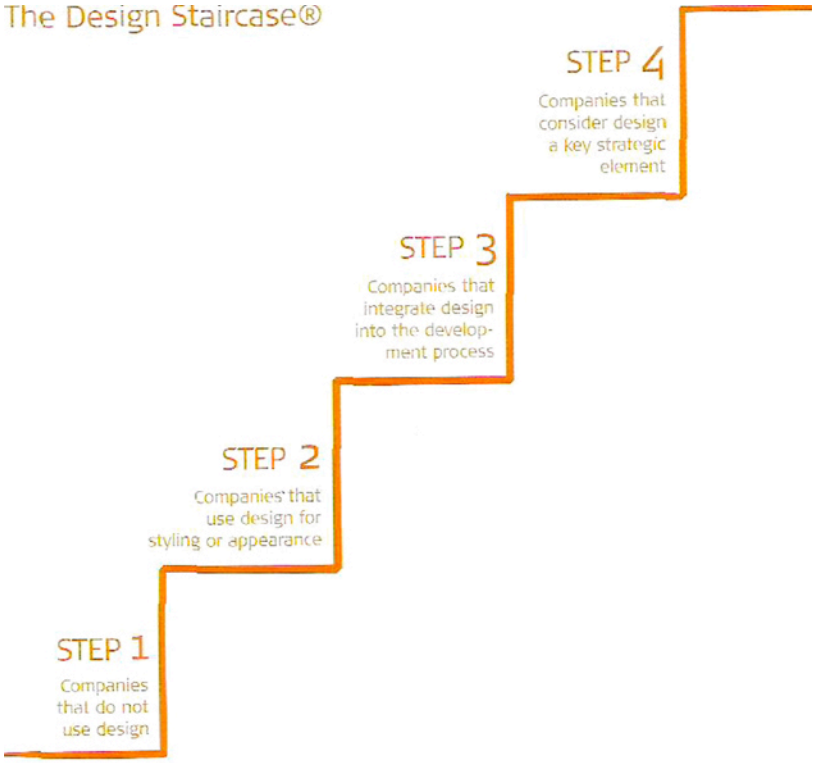


Fig 3: The Design Staircase® (Design Staircase 2001)

3.5.2. Design Atlas

The Design Atlas of the British Design Council is a tool for auditioning design capability within an organization. It consists of a set of questions revolving around the following areas: planning for design, processes for design, resources for design, people for design and culture for design.

3.5.3. DM-Framework

The DM-Framework was developed as an organizing agenda for the Bachelor course Design Management, International at Lucerne University of Applied Sciences and Arts – School of Art and Design. It has been used during research phases 1 and 2 and as a means to map the scenarios of design integration. The framework outlines three major areas of design impact or three major ways of implementing design and design management in a company.

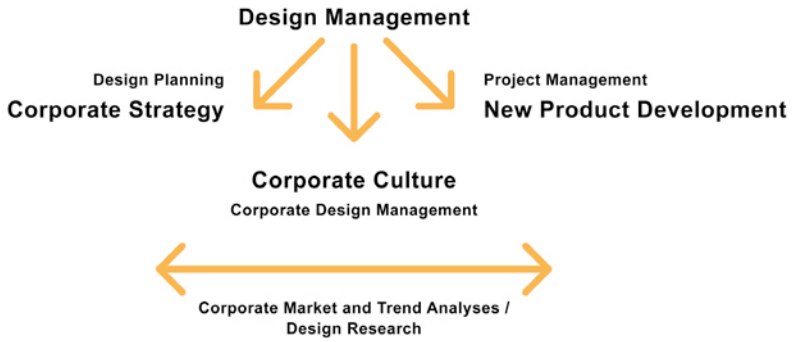


Fig 5: DM-Framework (Acklin 2007)

4. Research partners: portraits and questions

In order to illustrate the processes and results of research phases 1 and 2, two of the six companies are portrayed, and their questions regarding an improved use of design are outlined. Of these two companies, company A is the most design-driven and company B is the least design-oriented company of the participating SMEs.

Company A:

Company A is a leading producer of stoves, chimney stoves, electric mock fires, garden fireplaces, etc. Two partners founded it 25 years ago as an importing firm. Today company A owns production facilities in Scandinavia with an overall staff of 150 employees. Its main markets are Switzerland, Denmark, Norway, the Netherlands and France, followed by Belgium, Austria and the US. Company A has been successful so far due to highly innovative products combined with a consistent marketing and sales strategy. Design makes use of a distinctive design language and has always been part of the firm's business strategy and a

means to differentiate itself from its competitors. The company's fireplaces have earned design awards in Germany and in the USA.

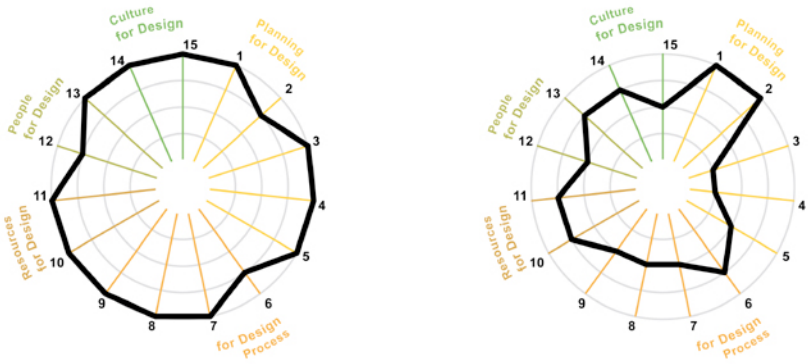
Company B:
Company B is a leading manufacturer of measuring devices for compression, temperature and power. It employs roughly 200 people. The firm is a subsidiary of a German manufacturing group, but due to its history and its size it operates, to a large part, independently. Its clients are chemical, machinery, aviation and medicine industries all over the world. Most of the company's products are for OEM markets, although it is also developing its own product ranges. The company has implemented a Kaizen process (continuous improvement process). Currently it is undertaking a cultural change from an engineering-driven manufacturing focus towards increasing customer orientation. Due to its OEM focus, the design of its products is engineering driven and standardized. Only recently the firm, in its quest to develop new non-OEM product ranges, identified design as a source of value creation, and currently is sourcing external design competency.

5. Results phase 1: profiles and findings

In phase 1 the current use of design of each company has been analyzed. This resulted in a design integration profile for each company based on the Design Atlas framework, and in a design maturity level based on the Design Staircase®.

5.1. Design Integration

The current design integration profiles of the two companies are informed by interviews with corporate management, the Design Atlas audit results and subsequent discussions held during the first workshops. The profiles of company A and B reflect differences in the use of design, with company A exhibiting the most prominent design use, and company B the least design use out of all six participating companies.



Company A Company B

Fig 7: Company profiles of design integration

5.2. Design maturity

The current design maturity levels of the two companies are informed by interviews with corporate management, the Design Atlas audit results and subsequent discussions held during the first workshops. Arrows and elaborations indicate the processes of change for company A and B from their current position towards attaining a higher position by means of individual design integration scenarios.

Company A:

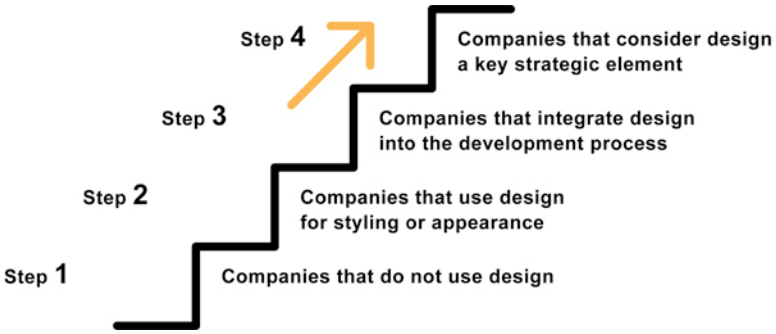


Fig 8: Design staircase for company A

Design is already an integral part of the company's corporate culture, new product development, strategic planning, etc. However, the company sees a number of improvements in how its core values, design philosophy and the most basic elements of its product language could be better communicated to its staff. The Idea discovery and generation phase of the design process is another subject that could be better communicated internally in order to make staff better understand where and how ideas and product concepts emerge.

Company B:

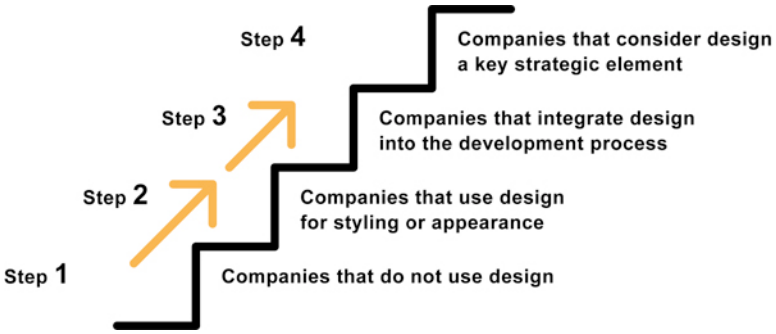


Fig 9: Design staircase for company B

Design is not yet an integral part of the company's mindset. However, the company is interested in the potential of design as a product differentiator and is engaged in explorative studies. It sees that a product language (level 2) needs to be developed and coordinated. It also understands that in order to do so beyond a pilot project, a design process (level 3) needs to be implemented alongside the engineering process.

6. Results phase 2: design integration scenarios

In phase 2 scenarios for design integration for all companies have been developed. This resulted in a plan for the implementation of improved ways of using design.

6.1. Design integration scenario for company A

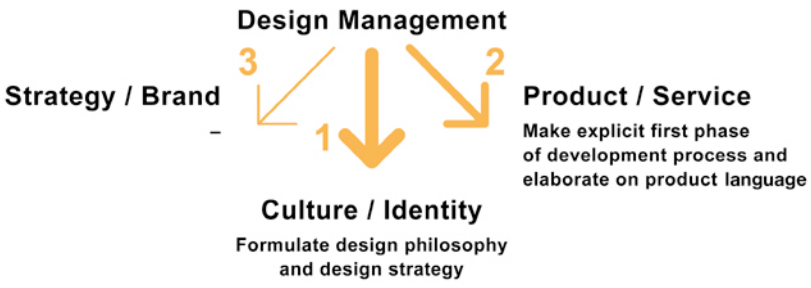


Fig 10: Design integration scenario for company A

Process:

At the beginning of the process, the team from company A worked on making its current design philosophy, which is expressed in all its products, spaces and communication, explicit by means of verbal statements. It

engaged in making the principles of product design visually explicit by means of structured “mood boards” that link sources of inspiration (taken from architecture, art and product design) to current product lines. It also engaged in translating its current ISO-based development process model into a process diagram that additionally displays relevant stakeholders and aims at making the process more transparent. The research team supplied both mood boards structure and process diagram.

This work proved to be a valuable process for the team from company A. By consciously going to the roots of the firm and its design philosophy the team became aware of what implicitly drives all designed expressions from the company. However, mood board structure and process diagram provoked discussions about their overall usefulness. Time beyond the research project’s timeframe will have to show whether communicating the company’s design philosophy and new product development process can strengthen corporate culture and staff’s identification with it.

6.2. Design integration scenario for company B

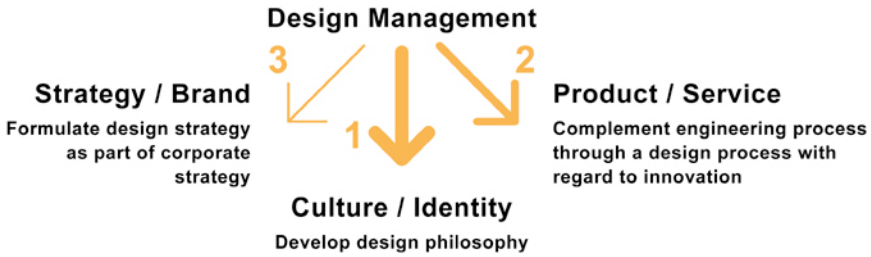


Fig 11: Design integration scenario for company B

Process:

At the beginning of the process, the research team worked with the management team on a future state regarding product design and its integration with engineering and marketing. The management team engaged in transferring aspects of their corporate vision into drafts for a design philosophy and a design strategy. The company also showed product design explorations that allowed the research team to get a glimpse of a current project. The research team helped in formulating a rough design briefing aimed at channeling product design studies.

Collaboration provoked major discussions throughout the process. They touched issues such as an aspiration for more explicit product design, skepticism about its overall need and usefulness, and bottom-up, uncoordinated action demonstrated with older products and upcoming packaging design concepts.

The overall process turned out to actually be very, if not too demanding and challenging on several levels. The research team identified limitations in using plain language to advance the idea of how management and design could be successfully linked, despite the use of case studies that showed the relationships between design philosophy, strategy and product language. Another challenge emerged with regard to team dynamics and the risk of abandoning the project.
At the end of the project, the company presented a new product to be launched in fall 2008, for which the company for the first time had sourced design skills from a design studio (product language) and from an advertising agency (packaging). The company plans to strategically use unique selling propositions based on engineering and design in order to beat a specific competitor.

6.3. Comparison and discussion

Comparing profiles and scenarios of design integration from company A and company B aims at clarifying success factors for the successful use of design. Regarding maturity levels on the Design Staircase® model, company A has been positioned on level 3, company B on level 1(2). Regarding the current use of design, significant differences between the two firms exist as becomes clear by comparing their profiles in the spider diagram below.

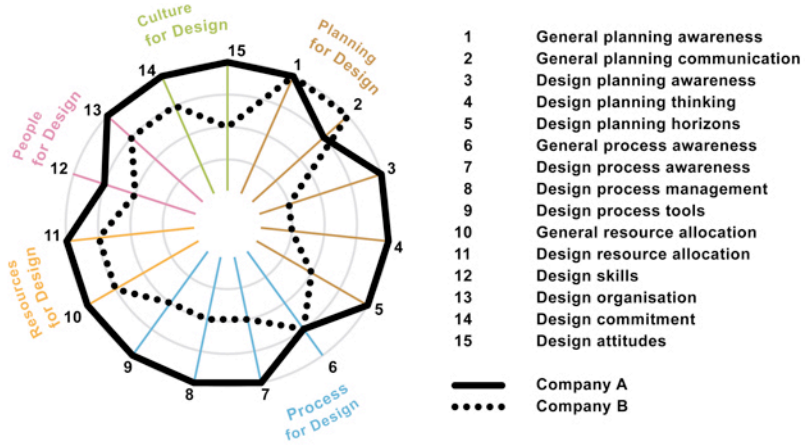


Fig 12: Comparison of design integration scenarios between company A and company B

The comparison makes evident that company A makes use of a number of critical success factors, which company B does not. Each of these success factors has a specific potential to leverage design capability, and by doing so to transform the business and maybe the future of a company.

These success factors are based on the findings from phase 1 (7.3. Findings) and can be summed up as follows:

– Include a design champion on the level of top management and create a design management function that has direct access to the decision-making processes of top management.

– Formulate a design philosophy as part of the mission or vision of the company, which then informs a design strategy and a consistent design language for all products and services.

– Implement processes for design such as the coordination of all internal stakeholders who make design contributions to strategy/brand, culture/identity, and product/service.

– Alter the “typical” process of improving products towards an innovation process that is complemented by a design-based innovation process.

– Allocate budgets, time and people to projects and establish adequate measurement tools. Start with pilot projects prior to company-wide implementation.

– Include design competency into all design-relevant business activities either through internal designers or through cooperation with an external design service provider.

– Create and foster a climate of innovation and creativity within the company and use every opportunity to communicate the strength of design as a strategic resource.

7. Conceptualizing the DM-guide: from concept to beta-prototype

7.1. Objectives

As stated above, the DM-guide should support SMEs to raise their design maturity level by helping them assess their design maturity and by finding specific ways towards realizing their full potential at their current or next higher level. Based on these objectives the research team decided that the underlying concept of the DM-guide should be based on the Design Staircase®.

7.2. Conceptual model

The conceptual model of the DM-guide relates the four basic perspectives to each other. Levels and goals are related to the current situation and goal setting on a horizontal axis (assessing design maturity: current and future). On a vertical level, triggers are related to success factors representing an operational relationship (finding ways to improve design integration). The conceptual model uses the four perspectives as its basic building blocks and entry points in order to understand the guide and to be able to use it in the intended way.

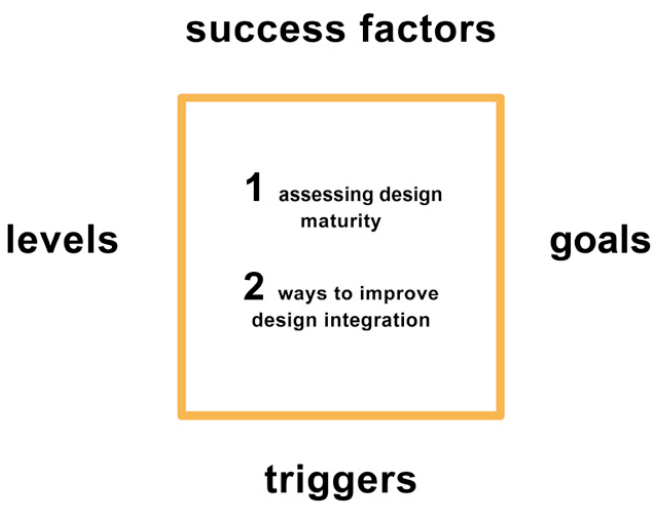


Fig 13: Conceptual model of the DM-guide

1. Levels

Levels correspond to the design maturity levels of the Design Staircase®:

– Companies that do not use design

– Companies that use design for style or appearance

– Companies that integrate design into the development process

– Companies that consider design as a key strategic element

2. Triggers

Triggers are factors arising from environmental spheres and stakeholders. Depending on a company's sector or main focus they may push SMEs to make greater and more effective use of design. The following triggers cover a broad enough field for the purpose of the DM-guide:

– Triggers from the economic sphere: new economic goals set; new companies or business units founded

– Triggers from the technology sphere: new materials invented; new technologies developed

– Triggers from the society sphere: new values of customers; new competitors and markets

– Triggers from the state as stakeholder: new laws implemented; new industrial norms set

3. Goals

Goals are business objectives that respond to challenges and triggers. They are desirable future states. For the purpose of the DM-guide they are framed in terms of design categories such as products, services, corporate design, marketing communication, brand management, and in terms of using design categories towards increased visibility, greater strategic orientation, better integration, increased differentiation, improved new product planning and innovativeness.

4. Success factors

Success factors are internal levers with the potential to trigger the dynamics of change inside a company. The list of success factors follows the categories of the Design Atlas, however with some modifications:

Design Planning: design leadership in support of corporate decision-making

Design Philosophy: design philosophy, design strategy and design language

Design Resources: budgets, time, manpower and controlling tools

Design Coordination: management and coordination of all internal stakeholders

Design Process: design-based research and innovation processes

Design Competency: skills and knowledge for design-relevant business activities

Design Culture: climate of innovation and creativity for the whole organization

7.4. Concept development, visualization and prototyping

Based on the conceptual model, the research team engaged in a five-step process that led to a beta-prototype.

Step 1:

In the initial phase, three different visual metaphors (suitable for both intended users, i.e. senior management of SMEs, and intended use, i.e. a pragmatic way to approach design-related questions) were presented to and discussed with four company teams: the Matrix; the Map; and the Staircase.

Main insights touched upon the issues of hierarchy and usability. It was mentioned that the metaphor should not imply that design maturity levels are a question of hierarchy, but are equally legitimate states of being. It was also said that the metaphor should not be too abstract, but rather make a connection with something familiar. Overall the metaphor of the map was clearly favored by all companies.

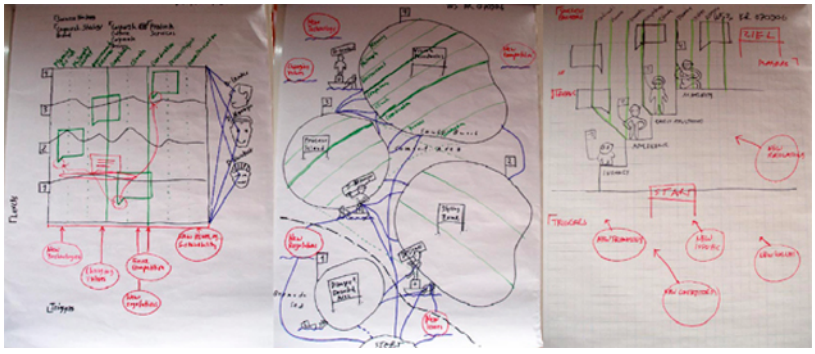


Fig 14: Conceptual prototypes of three metaphors: the Matrix; the Map; and the Staircase

Step 2:

In the next step the research team designed a travel guide using graphic design, storytelling, game design and further visual differentiation of the initial metaphor to create an archipelago, displaying islands, routes between islands and resources on the islands.

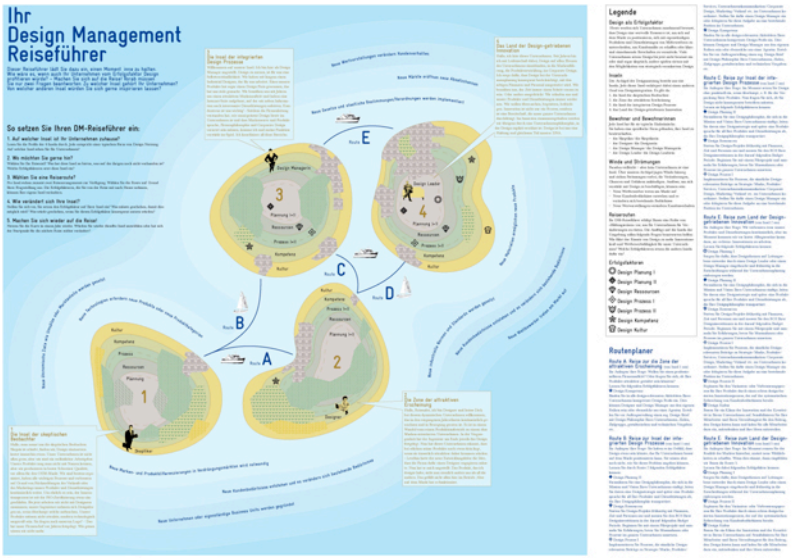


Fig 15: Concept and visualization

Step 3:

Next the research team did both behavioral and appearance prototyping with experts, i. e. representatives from the School of Business.

Main insights touched upon understanding the rules of the game/guide, identification with one of the four levels/islands, understanding the success factors, appraisal of language, and comprehensibility of some of the visual elements. Feedbacks also included questions of function, structure and properties.

Step 4:

In the next step, the research team used a revised version of the prototype and did behavioral and appearance prototyping together with all company teams (1-3 representatives each) in a focus group like format. Prototyping included specific questions on concept and appearance.

This final prototyping session with all company teams produced an overall positive response. All companies understood the metaphor and could find “their island”. However, a difference was found with respect to getting started (e.g. the least experienced company in terms of design had more difficulties than the most

experienced one). Prototyping also revealed that the guide itself is a good thinking tool, but does not suggest detailed means or tips on how to implement design projects or a design management function.

Step 5:
In a final step, the research team did another refinement of appearance and visualization issues based on insights from the final prototyping session. The result led to the design of a beta-prototype.

7.5. Beta-prototype

Through designing and prototyping, the initial conceptual model was translated into an easy to understand, easy to use, visually attractive orientation device, named "Design Management Travel Guide" („Ihr Design Management Reiseführer"). The result was achieved by using designed means such as visual and narrative metaphors, characters from storytelling and rules from game design. The basic underlying metaphor comes from the field of cartography, displaying a sea map of a fictitious archipelago of four islands. Each represented a specific degree of design maturity (levels), with routes departing from one island and arriving at the other where one could find and learn more about the resources (success factors) necessary for achieving an improved way of design integration (goals), and with a wind rose representing challenges and winds of change (triggers) for all islands of the archipelago.

A set of rules explains how to use the map: to look for the island, which represents the company's situation best, to identify the triggers that might ask for a different way of design integration, to choose between routes to get to the next island and find the success factors necessary to achieve the company's goals. On each island a typical inhabitant (character) represents a specific form of design integration (or design awareness), welcomes travelers and explains some of the success factors treasured on the island.

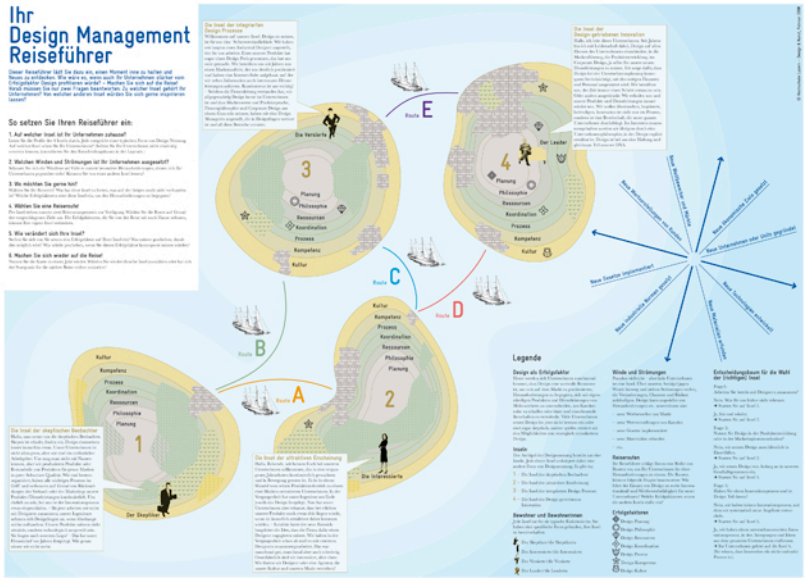


Fig 16: Beta-prototype

8. Conclusions

Although the consortium perceived the process of design integration scenario development and the results of the project as successful, the research team made two main observations:

1. The topic of design (and with that the project itself) often was an object at risk due to pressures and challenges from daily business. Three companies engaged in pilot projects for which they sourced design skills in order to create “good practices”, in the hope of stating the case of successful design use to a (skeptical) senior management. Time will tell whether the design integration scenarios will actually be implemented and bear fruit in terms of business success and higher design awareness on the level of company decision-making.

2. Most companies expressed the intention to innovate, but they either did not understand what the contribution of design to innovation is, or they all together lacked some of the fundamental processes, methods and knowledge in order to do so. It was only with one company that the innovation management process was revised and design was included at crucial points of the process.

The DM-guide proved to be easy to use for all companies, whether they performed on levels 1-2 or 3-4; it was able to trigger awareness, discussions and even plans of what should be done next in the company. Interestingly enough, the most design-led company was as much able to draw conclusions from the work with the DM-guide as the least design-led one. It was stated that the implementation of design and design management (and the fostering of innovativeness of a company) is a continuous iterative process of (self-) development. It was also said, that at the moment the guide might not yet speak for itself.

Further tests with companies, for whom the subjects of design and design management will be novel, will have to tell whether the DM-guide needs a supportive and explanatory context such as for example workshop formats or media. New research aimed at improving the guide will focus on describing the relationship between design and innovation as well as between design management and innovation management in more detail and on bringing innovation processes and design processes closer together.

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Design-Driven Innovation Process Model

by Claudia Acklin

According to the Cox Review (2005), *various internal and external factors both advance and hinder the innovation capabilities of small and medium-sized*

enterprises (SMEs). Regarding the use of creative talent and innovation capabilities, the report mentions the following obstacles: lack of awareness and experience; lack of belief in the value of, or confidence in, the outcome; not knowing where to turn for specialized help; limited ambition or appetite for risk; and too many other pressures on the business. Regarding the use of design, the report mentions the following obstacles: cost, lack of in-house design or creative skills, lack of customer demand, manufacturing or development issues, lack of access to external designers or creative skills, regulatory issues/government bureaucracy, and design not being considered as important.

On the other hand, an earlier study (Bougrain and Haudeville, 2002) comes to the conclusion that the presence of in-house design teams enables companies to absorb know-how from industrial networks of the regional innovation systems more quickly. So there is a correlation between design and the innovation capabilities of a firm.

Two applied research projects in Central Switzerland aimed at introducing design and design management to 11 SMEs with little or no design experience. After assessing current use of design in each of the SMEs and introducing them to design's potential benefits, researchers worked with the companies' project teams to develop specific design strategies and innovation projects. These ranged from

improving customer experiences through optimizing Web sites and other touchpoints to developing design guidelines for the product language of such items as pressure and temperature measurement devices or for the corporate identity of a business-to-business (B2B) company entering the business-to-consumer (B2C) market.

During theory building within these two projects, we explored the contribution of design research, design leadership, and design management to a generic innovation management model. In a second step, we developed a design-driven innovation process model featuring six phases: impulse, research, development, strategy, implementation, and evolution. Our model is integrative, multidisciplinary, and permeable in order to meet the needs of SMEs for easy implementation and cost and risk reduction.

Past and current projects in Central Switzerland

Central Switzerland is home to many SMEs that face all of the above-mentioned obstacles. A project undertaken by the Lucerne School of Business Administration (Wolf, Schweikert, Küchler, and Stössel, 2005) identified typical patterns of innovation capability. While the majority of the most innovative SMEs give recognition to aspects of design management in their innovation processes, most of the other SMEs overlook factors relevant to design management, for example, the early inclusion of all relevant stakeholders in the product development process.

Two projects (Acklin and Hugentobler, 2008; one ongoing) undertaken by the Lucerne School of Art and Design investigated the state of design integration in 11 SMEs in Central Switzerland. These projects were aimed at increasing the innovativeness of regional SMEs by intensifying cooperation either with the university or with other relevant actors in the regional innovation system. Of special interest to the researcher were companies with little or no know-how in applying design and design management to their research and development (R&D) activities and their innovation planning. Within those SMEs the potential of using design as an aid to improve the so-called bottom line is especially high.

The main findings from these two applied research projects referring to the integration of design and design management and to their innovation capabilities are:

- *Design integration.* All the companies did have a basic understanding of design as a means to improve the functionality and ergonomics of products beyond making them look more beautiful. However, few companies considered design as a strategic resource to improve company positioning or the relationship with the customer. Designers were rarely involved in the product development processes; they were used on an ad hoc basis, mostly for the development of corporate communication materials. Furthermore, the culture of companies with little or no design know-how—for example, technology-led SMEs—tended to be goal oriented and favored a decision-making attitude with a strong focus on effectiveness and efficiency. In these companies, design appeared to be a "nice-to-have" rather than a "must-have" factor in the development process.
- *Innovation.* Most of these companies lacked adequate resources (space, time, people, money) for innovation. In some of these firms, innovation processes did not exist, mainly because they were in the original equipment manufacturing business and had not been exposed to the consumer market. However, some of them had considered entering the B2C market to become more independent from their B2B customers. In some cases designers were part of the staff, but the companies were lacking the preconditions for more radical innovation because the boundaries of new product development and innovation

A basic understanding and acceptance of design and design management need to be established in a company (sensitization); *second, design methods need to be introduced and practiced within a specific problem area or pilot project* (application); *and third, design management has to be implemented in a sustainable way into the processes of the company* (implementation).

processes were blurred together, causing incremental improvements of products to be mistaken for (game-changing) innovation. This was not helped by the fact that a clear innovation strategy was often missing.

- *Implementation*. Many of the projects undertaken by the 11 companies were postponed or even shelved at some point in the process of collaboration with the researchers. The capability to carry an idea or an innovation project through to completion and to commercialization intending to achieve market success was often missing. Pressure from daily business and, more recently, concerns because of the financial crisis were pushing innovation projects into the background. This was magnified by the lack of a culture that sustained a climate for innovation.

The problem at stake

The challenges for the researchers in the above-mentioned projects were and still are manifold: First, a basic understanding and acceptance of design and design management need to be established in a company (*sensitization*); second, design methods need to be introduced and practiced within a specific problem area or pilot project (*application*); and third, design management has to be implemented in a sustainable way into the processes of the company (*implementation*).

To overcome these challenges, we are building on the following assumption: If design or design management is not to be perceived by SMEs as something separate and unintelligible done by somebody else, models and tools need to (1) integrate well-known concepts of business sciences and processes that are already (at least partly) implemented in these companies and (2) be easy to use and understandable, for example, through using visualization or storytelling to support their application.

For the early phase of sensitization of SMEs, an easy-to-use, visually attractive orientation device, the "Design Management Travel Guide," was developed (see Figure 1).[1] With this guide, SMEs are able to assess their level of design integration and, with the support of a design consultant, come up with a basic design strategy to improve market positioning and customer focus. The guide was developed at the end of the first research project with the intention of validating it in a following project of similar scope. The guide was successfully tested with the next batch of SMEs: They were able to use it and to self-reliantly draw some conclusions about their then-current use of design.

1. The basic underlying metaphor comes from the field of cartography. It displays a sea map of a fictitious archipelago of four islands. Each represents a specific degree of design maturity (cf. the Danish Design Staircase, 2001), with routes departing from one island and arriving at the next, where one can find and learn more about the resources necessary for achieving improved design integration. A "wind rose" represents the challenges and winds of change for all islands of the archipelago. For more information, see Acklin and Hugentobler (2008).

Ihr Design Management Reiseführer

Dieser Reiseführer lädt Sie dazu ein, einen Moment inne zu halten und Neues zu entdecken. Wie wäre es, wenn auch Ihr Unternehmen stärker vom Erfolgsfaktor Design profitieren würde? – Machen Sie sich auf die Reise! Vorab müssen Sie nur zwei Fragen beantworten: Zu welcher Insel gehört Ihr Unternehmen? Von welcher anderen Insel würden Sie sich gerne inspirieren lassen?

So setzen Sie Ihren Reiseführer ein:

1. Auf welcher Insel ist Ihr Unternehmen zuhause?
Lesen Sie die Profile der 4 Inseln durch. Jede entspricht einer typischen Form von Design Nutzung. Auf welcher Insel sehen Sie Ihr Unternehmen? (Sollten Sie Ihr Unternehmen nicht eindeutig verorten können, konsultieren Sie den Entscheidungsbaum in der Legende.)

2. Welchen Winden und Strömungen ist Ihr Unternehmen ausgesetzt?
Schauen Sie sich die Windrose an! Gibt es zurzeit besondere Herausforderungen, denen sich Ihr Unternehmen gegenüber sieht? Könnten Sie von einer andern Insel lernen?

3. Wo möchten Sie gerne hin?
Wählen Sie Ihr Reiseziel? Was hat diese Insel zu bieten, was auf der ihrigen noch nicht vorhanden ist? Welche Erfolgsfaktoren setzt diese Insel ein, um den Herausforderungen zu begegnen?

4. Wählen Sie eine Reiseroute!
Pro Insel stehen zumeist zwei Reisearrangements zur Verfügung. Wählen Sie die Route auf Grund der vorgeschlagenen Ziele aus. Die Erfolgsfaktoren, die Sie von der Reise mit nach Hause nehmen, können Ihre eigene Insel verändern.

5. Wie verändert sich Ihre Insel?
Stellen Sie sich vor, Sie setzen den Erfolgsfaktor auf Ihrer Insel ein? Was müsste geschehen, damit dies möglich wird? Was würde geschehen, wenn Sie diesen Erfolgsfaktor konsequent nutzen würden?

6. Machen Sie sich wieder auf die Reise!
Nutzen Sie die Karte in einem Jahr wieder. Würden Sie wieder dieselbe Insel auswählen oder hat sich der Startpunkt für die nächste Reise seither verändert?

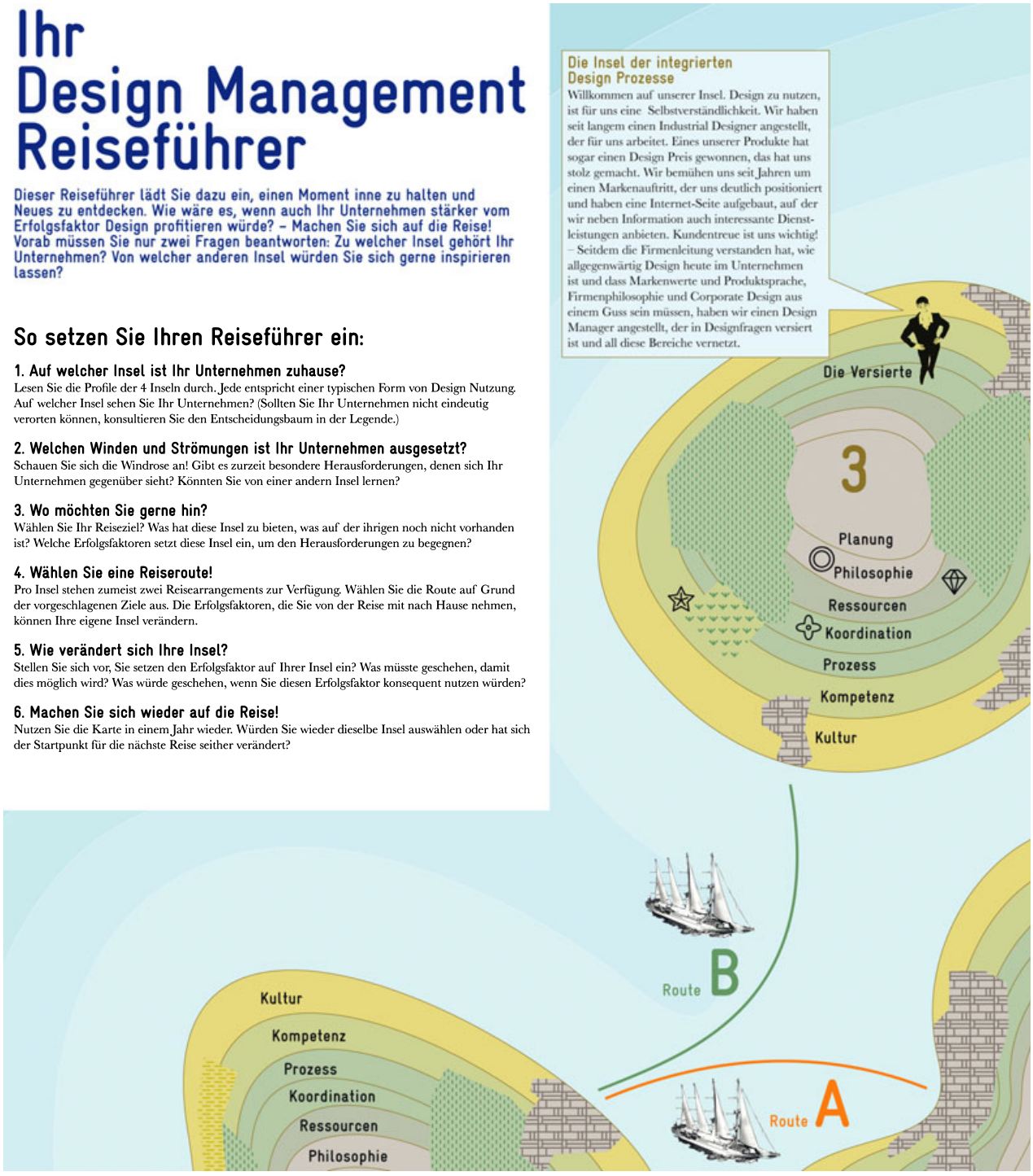

Figure 1. The "Design Management Travel Guide" is meant to help SMEs assess their level of design integration. A design consultant can help them come up with a basic design strategy to help the company with market positioning and customer focus.

To lower company barriers to the integration of design and design management during the *application* of design—for innovation projects, for example, or during implementation of new processes and procedures, classic innovation management models were adapted to include design thinking. (The term *design thinking,* as coined by Boland and Collopy [2004] or Brown [2008] is understood as the introduction of design methodology—for example, the design process—to companies and, in the long term, anchoring design in the company culture.)

In the following, we first discuss the contribution of design research, design management, and design leadership to innovation management. Second, we present a design-driven innovation management model that operates on the above-mentioned requirements of ease in understanding and familiarity with use.

Classic innovation management models

Many innovation management models—the stage-gate variety, for instance (Cooper, 1996; Cooper and Kleinschmidt, 1990), and the innovation funnel (Benkenstein, 1998)—do not mention the use of design explicitly. Industrial design is considered to be part of the company's R&D, or it is included in the conception phase. So the full potential of design methodology, such as design research methods in the early stages or design management in the later phase of the commercialization of product development, remains untapped. Ulrich and Eppinger (1995) included design in the product development process but did not mention the contribution of design and design management to the so-called fuzzy front end or to the final product launch.

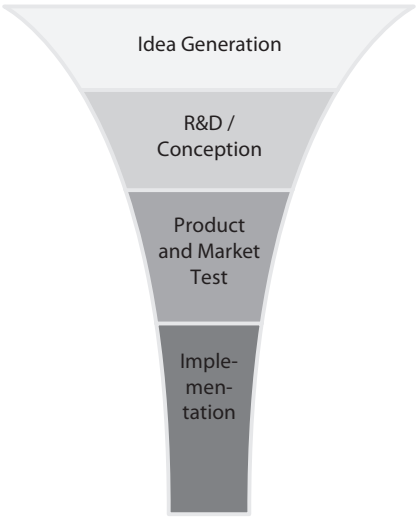

Figure 2. Innovation funnel according to Benkenstein (1998). The bigger the mouth of the funnel, the more ideas will be introduced into the R&D activities of the company.

In the model displayed in Figure 2, idea generation is described as a funnel through which many ideas flow into the company. The bigger the mouth of the funnel, the more ideas will be introduced into the R&D activities of the company. During their flow through the funnel, ideas will be constantly tested; some will be discarded, and only a few will turn into full-fledged innovation projects. The resulting products will be tested before they ever go on the market; their viability on the market will be considered both after conception and before their final implementation.

The funnel model depicts the innovation process like a tunnel with a bottleneck, from which only the strongest projects emerge; only the very beginning of the process is open to the full ecosystem of a company (i.e., its environment, including customers, suppliers, partners, and competitors). This model also leaves open the methods by which the funnel is "filled"; ideas essentially fall out of the sky and find their way into the funnel. It is our understanding that the early phase of innovation management—the fuzzy front end—is crucial to the later direction and result of an innovation project. This phase is also a stage at which the systematic and proactive buildup of customer insights is neglected, and consequently early ideas are often not connected to existing or latent customer needs.

For SMEs with few financial or human resources, the funnel model poses a few more problems. Very often the ideas are there, coming from R&D, marketing, sales, or senior management. But the company still has to digest a large number of ideas in order to select the most promising for further development, mostly without having the means to do initial market or user research beforehand. Essentially, SMEs tend to be risk averse because they have

few fallback positions, and therefore the early assessment of the ideas with the most market potential is vital to them in order to be able to use their financial resources parsimoniously. Another hurdle is the alignment of company processes needed to launch a new product or service and to follow up on subsequent customer experience issues. The new offering also carries with it questions that must be addressed regarding proper branding and communication strategies.

Contributions of design and design management to innovation management

Design and design management are able to make many contributions to innovation management, from the very beginning through to implementation on the market. In this paper, we have divided these contributions to innovation management into categories of *design*, *design research*, *design management*, and *design leadership*. All of these categories offer various activities, tools, methods, and processes to complement innovation management processes.

For instance, Turner and Topalian (2002) subdivided design management into two dimensions or fields of activity: design management and design leadership. Design management is considered reactive because it mainly manages the resources, time, people, and money necessary for design activities in a company; and design leadership is considered proactive in setting the agenda of an enterprise using design for competitive advantage and envisioning the future. We include a third dimension into our definition of design management: design thinking, which acts as a bridge between the reactive and the proactive notions of design management by establishing a sustainable culture for design in a company (Acklin, 2009).

Figure 3 places the above-mentioned aspects of *design, design research, design leadership,* and *design management* and its deliverables into a framework that connects them to the phases of a generic innovation management model.

In the early stages of idea generation and selection, the main contributors are *design leadership* and *design research*. Design-driven innovation management and the alignment of projects to the identity and brand of a company are central tasks of *design leadership*. Design leadership also establishes the necessary structures and processes inside a company through which organizational learning and the observation of emerging market trends form the foundation for a future innovation strategy. A starting point of innovation projects can be the creative reframing of the problem the project sets out to solve; by reframing the problem and formulating a first hypothesis, new approaches and solutions beyond incremental changes become more feasible. The process of idea selection is accelerated as well.

First hypotheses will have to be researched in more depth in a triangulation of market, user, and technological research. *Design research* provides insights into (latent) customer needs through the use of ethnographic research or the research of contexts in which product and services are being used. During concept development, further research phases can deepen the understanding of customer behavior, use of the new product or service through user testing, and so on.

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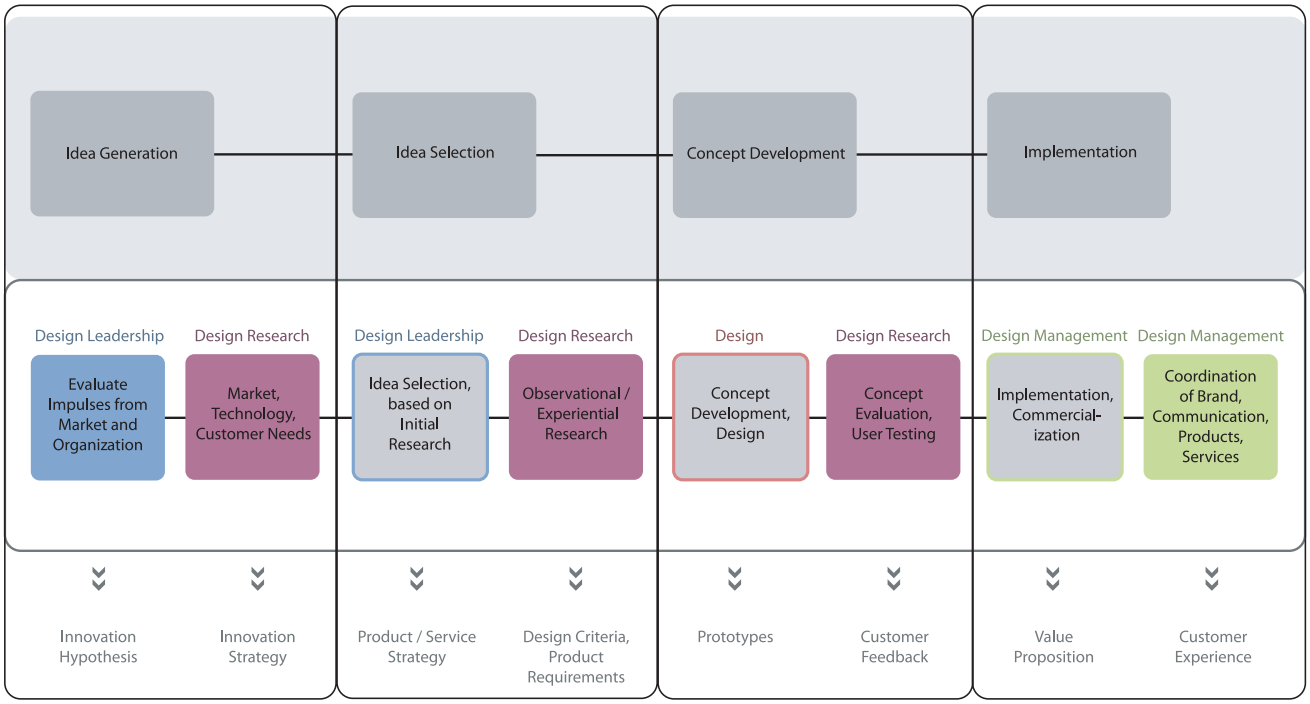

Figure 3. Contributions of design and design management to innovation management and its deliverables.

Finally, design management is an activity that is helpful for the implementation of innovation projects inside the company as well as connecting management functions and processes and connecting philosophy with strategy and delivery. Design management will also, by operating as a coordinator, design a coherent customer experience for the new product or service at all customer touchpoints.

Design-driven innovation management model

For SMEs with processes that are often flat and sometimes less standardized compared to structures and processes of large organizations, we propose to intertwine strategy building, innovation management, and design management into a process that includes the six stages defined in our design-driven innovation management model (see Figure 4): impulse, research, development, strategy, implementation, and evolution. These stages do not necessarily need to be executed in a linear succession but can be carried out concurrently.[2]

The more or less formal starting point of the process is the impulse stage; it comprises a mix of market observation and analysis and an assessment of what the company has learned so far. This stage aims to describe what kind of market and customer trends have been emerging and to formulate a first hypothesis. In the research phase, appropriate methods are applied to understand the question in more depth: these can include ethnographic, trend, and experiential research, but also technological and market studies. The development stage should be informed by criteria deducted from the analysis of the research material.

In this model, the strategy phase follows the impulse, research, and development stages and is not

2. An early contribution to the model building phase was made by Norbert Welti.

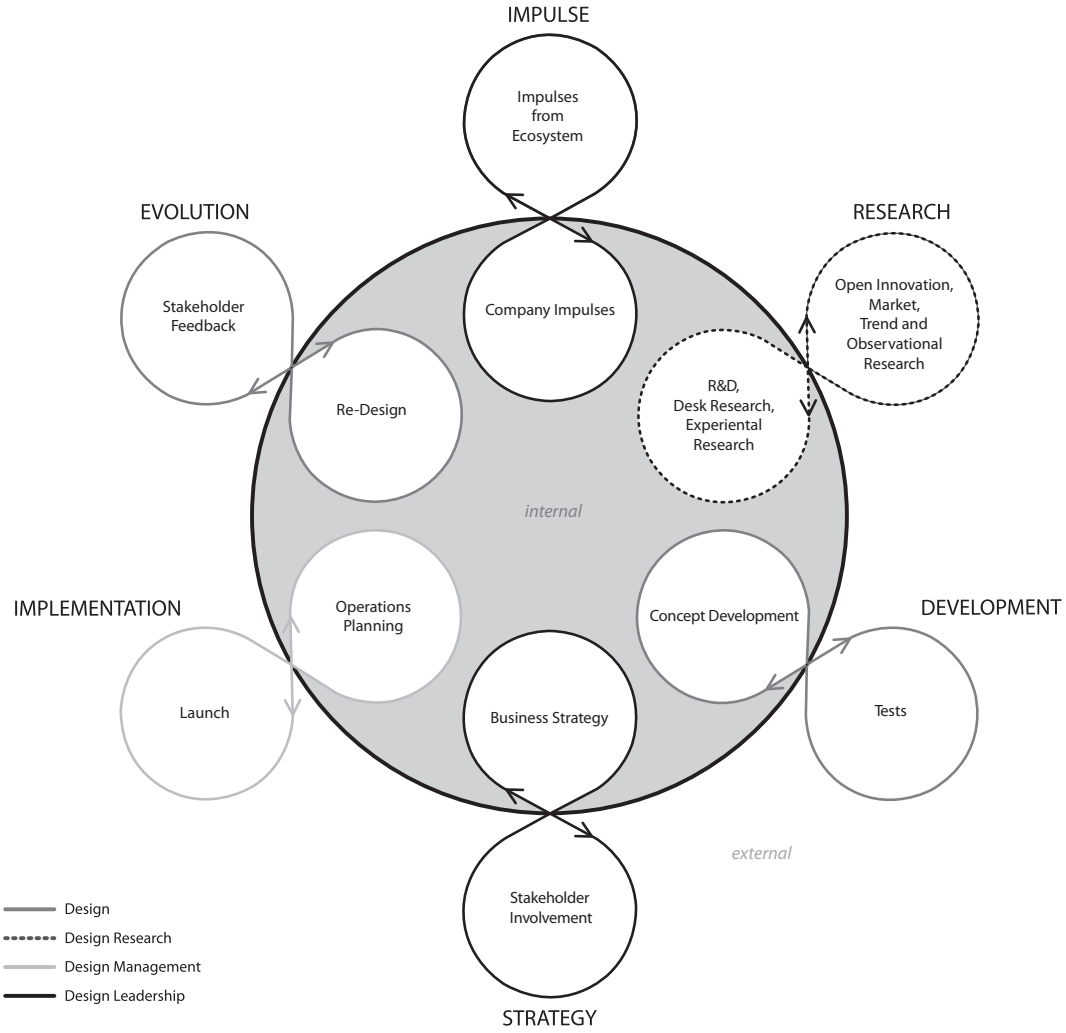

Figure 4. A design-driven innovation management model. The stages do not necessarily need to be executed in a linear succession but can be carried out concurrently.

the starting point. The logic behind it is that it puts the new offerings themselves in the forefront, rather than the business analytics. Switching around the sequence of stages allows business strategy development to be enriched by data on trends, customer needs, emerging technological trends, and so on, as well as by the involvement of suppliers and other stakeholders, which will improve market power.

In the implementation phase, appropriate adjustments of operations and measures for the launch, such as an adapted brand and communication strategy, can be made involving design management as a coordinator and enabler of the overall customer experience connected to the new offering. The last stage, with a strong emphasis on stakeholder involvement and customer feedback, is the evolution phase, in which the innovative product or service is improved.

Main characteristics of the model

Our design-driven innovation management model has the following

main characteristics: it is *integrative*, *multidisciplinary*, and *permeable*.

Integration

According to "The New St. Gallen Management Model" (Rüegg-Stürm, 2003), in recent years process organization (*Ablauforganisation*) has become more important and has pushed back the organizational structure of the company itself (*Aufbauorganisation*) as an organizing system for companies. In short, the focus has shifted from hierarchy to process, and this has been done for reasons of efficiency. Borja de Mozota (2003) has described a shift in management models from "a hierarchical Taylor model of management to a flat and flexible organizational model, which encourages individual initiative, independence and risk taking" (p. 67). Design and design management can be the advocates of this new management style.

There is also a correlation among strategy, structure, and culture and the way in which they shape processes. Intertwining strategy building, innovation, and design management allows the creation of new and meaningful products, services, and experiences to become the company's core activity. Innovation becomes the driver, and all processes are designed around the bigger goal of staying on the market. One could even say that the innovation process is actually the iterative process of designing a company to meet customer and market needs. Fortunately for them, SMEs find it easier to change and adapt processes than do larger companies.

Multidisciplinarity

To consistently involve members from a variety of management functions—marketing, engineering, sales, communication, design, and so on—in the innovation process has been described as the "sashimi approach" in a reference to design management styles from Japan (cf. Cooper and Press, 1995). Multidisciplinarity is also a central ingredient of design thinking. Stanford's D-School[3] currently builds on a model of collaboration in which the intersection of business, technology, and human factors is explored. Besides the more obvious reasons of capability building and risk control in innovation projects, multidisciplinary teams—and more precisely the early collaboration of engineering and industrial design—function as an accelerator; products are more easily and speedily pushed to the market through combining technological development and human-centered design. An additional side effect of multidisciplinary teams is what Dumas and Mintzberg (1989) called "infusion." Design methodology is implicitly being included in the above-mentioned stages; it is simply part of the way innovation is done in a company. Integrating design into all activities connected to innovation management allows it to become a part of everybody's business.

Permeation

Each stage includes a more inner-oriented or outer-oriented activity; this does not mean that an SME should completely dispose of its boundaries and its distinctness from others. To consistently encourage, attract, and include know-how from the ecosystem and from stakeholders into the company calls more for a particular frame of mind than for an organizational principle. For example, the R&D activities of a firm can be combined with methods of open innovation by inviting consumers and lead users to cocreate new offerings. Many (technology-based) SMEs take pride in their innovations—at times so strongly that they exhibit the "not invented here" syndrome. Using frequent feedback loops with customers, suppliers, and other stakeholders throughout the development process means SMEs will have a better shot at reducing the risk of market failure for a new product or service. In a market environment in which sudden shifts make it difficult to plan or even to understand market dynamics, an SME with a more flexible, open, and permeable attitude may find it easier to survive.

3. For a look at the Stanford model, visit http://stanford.edu/group/dschool/big_picture/design_thinking.html.

Discussion

An integrated model in which strategy building, innovation, and design management become one unified process has advantages. We did not test the model yet; however, some of the first reactions of SME chief executive officers to it were positive. The model made sense to them; the phases of impulse, research, development, strategy, implementation, and evolution were easy to understand and familiar to them and resembled some of the processes of their own companies. The model also implements the prerequisites we formulated early in this paper: adapting frameworks that already existed and visualizing for ease of use.

The disadvantage of this model is that it blurs the boundaries of design and business notions to an extent that the design and design management contributions are no longer recognized as such. (In properly applying design methodology, the devil is in the details.) Thus the model might be misleading to SMEs with little or no design experience because some of the methodology is actually new to them and will have to be practiced many times before it can become part of their company's innovation process and even part of company culture. This also means that designers and design managers need to become permanent staff members of SMEs.

Conclusion

The present formulation of a design-driven innovation process model has been developed particularly for SMEs with little or no design awareness so far. It will have to be validated through further applied research with companies. SMEs have fewer financial resources available than their larger competitors and are less inclined to include design consultants or designers in their activities and innovation processes; thus another challenge for future research will be to address the question of whether more tools and models based on design methodology and design thinking (as well as being inexpensive in their application) can be developed to support SMEs in the integration of design into their company activities and innovation processes. ■

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Author biography

Claudia Acklin studied social pedagogy and journalism and worked for more than 12 years as a journalist. During that period she produced and directed two full-length documentary films. In the past years she has mainly been working in research and the educational field developing new study programs such as the BA in Design Management, International at Lucerne School of Art and Design in Lucerne/Switzerland. She has been the head of the program ever since its start in 2006. She is also the head of a research group, "Design and Management," and has been doing research in the area of accessibility, design management for SMEs, and design-driven innovation. In 2008, she co-founded the association "Swiss Design Transfer," a regional center for design promotion and support for SMEs. Last year, together with the Commission of Technology and Innovation (a national research body), she held a "Swiss Design Initiative" that invited stakeholders from the design field to discuss the question of whether a national design policy for Switzerland was needed. The result was a first position paper on this issue.

THE ABSORPTION OF DESIGN MANAGEMENT CAPABILITIES IN SMEs WITH LITTLE OR NO PRIOR DESIGN EXPERIENCE

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ABSTRACT

In the past, design support programmes for companies with little or no design experience have focused on match-making between designers and SMEs. In addition, it has been recognised that design support should be about the business and leadership role of design and about promoting design tools as well as design management methods. However, a sustainable introduction of new design knowledge involves a process of organisational learning on the side of the SME. How exactly companies absorb new design knowledge has been underinvestigated. There is also a lack of a tool to analyse or guide such a learning process. Based on the Absorptive Capacity and the Dynamic Capability constructs, this paper proposes a Design Management Absorption Model to measure the progression of new design knowledge absorption. This model, which connects the three streams of innovation, strategic management and design studies, makes a contribution to practitioners from national design support programmes, to the design practice working with SMEs as well as to companies themselves. It represents a blueprint and an instrument for the analysis of a learning journey to introduce design management capabilities in companies with little or no design experience.

INTRODUCTION

It has been argued that design has four powers to add to a company's bottom line and innovation capability. Borja de Mozota (2006) states that, firstly, design is a differentiator and through that a source of competitive advantage; secondly, design is an integrator by improving new product development processes, thinking in product lines and fuzzy-front end project management, and using user-oriented innovation models; thirdly, design is a transfomer through creating new business opportunities and improving the company's ability to cope with change; and fourth, design is good for business because it increases sales, margins, brand value, greater market share, return on investment and others (Borja de Mozota 2006). While design-oriented companies in the B2C business mostly are aware of these powers and use them skillfully, many technology-driven or service-oriented companies are up to now unaware of design as a strategic resource and/or unskilled in the use of it (Bruce, Cooper et al. 1999; Acklin and Hugentobler 2008; Kootstra 2009).
Design is an "experience good" (2009), meaning that trust in the powers of design has to be built up by experiencing its efficiency and effectiveness. Knowledge about design as a strategic resource has to be *acquired, assimilated, transformed and exploited* either through the integration of designers into business processes or by other forms of incorporation of design knowledge and capabilities. The adoption of design and

design management by companies with little or no design experience is an active learning process because these companies are only partially able to build on prior knowledge of the value of design and design management.

In recent years, different national design support programmes have been promoting the value of design and supporting companies to adopt it. Other vehicles in introducing design approaches and capabilities to SMEs are knowledge transfer and applied research projects between universities and companies. Lately, it has been recognised (Boult 2006) that design support should be about the business and leadership role of design and about promoting innovative tools as well as design management methods. This proposition has been supported by the broader discussion on design thinking (Boland Jr. and Collopy 2004; Brown 2008; Brown 2009; Martin 2009), which also strongly focuses on the issue of enabling companies to manage as designers.

Past research (Kotler and Rath 1984; Bruce, Cooper et al. 1999; Perks, Cooper et al. 2005; Borja de Mozota 2006; Chiva and Alegre 2009) identified different design and design management capabilities to deploy design effectively in companies. However, how exactly design and design management capability is built, is underinvestigated.

In innovation studies, the ability to absorb and assimilate external knowledge is viewed as critical for a company to innovate (Cohen and Levinthal 1989; Cohen and Levinthal 1990; Nonaka 1994; Nonaka and Takeuchi 1995). In 1989, Cohen and Levinthal introduced the Absorptive Capacity (ACAP) construct, which deals with the question of how companies absorb external knowledge and to which end.

The ACAP construct provides a helpful framework to describe the absorption process of external design knowledge during new product development or innovation projects[1]. In 2002, Zahra and George connected the ACAP construct from the innovation studies to the resource-based view and to the dynamic capability concept from strategic management studies suggesting that absorptive capacity can lead to deep organisational change through impact on the overall resource base of a company and thus increase strategic flexibility.

There are strong overlaps between design management and strategic management (see e.g. Borja de Mozota, 2003) and between design and innovation (2009). Although design is often only part of the bigger equation of creativity + design + implementation = innovation (Von Stamm 2008), there still are strong overlaps between the two notions. Both stress the point that learning is a fundamental activity of design and innovation processes (Kelley and Littman 2004; Lazonick 2005), or design-driven innovation is seen as the result of generating and integrating new knowledge in the area of technology, user needs and language (Utterback, Vedin et al. 2006).

While Cohen and Levinthal (1990) mainly look at the R&D activities of a firm without connecting the ACAP construct to design knowledge and design capabilities, a later publication (Abecassis-Moedas and Mahmoud-Jouini 2008) focuses on complementarities of the learning relationship between recipient (firm) and source (external design company) when designing new products. The paper's point of departure, though, is the interaction of the firm with the "archetypical" designer who as author introduces his knowledge to the recipient team rather than the absorption of design management capabilities by the firm as part of their organisational capability.

In this paper, we adopt a process-oriented view of design and design management capability as a result of an organisational learning and absorption process rather than extracting specific single design capabilities from best practice of e.g. product development processes or as a result of collaboration with external designers. Transformation through design and design management can only be described properly by looking at the processes of the adoption of design.

For this reason a conceptual model that connects the ACAP construct to the absorption of design knowledge and design management capabilities in design and innovation processes has been developed. It facilitates the analysis of the absorption process a company goes through if it is willing to use design as a strategic resource.

In Central Switzerland, an action research project was conducted with five companies with little or no design experience with the aim to develop company-specific design strategies and projects and to improve their design capability. In this paper we will analyse the results of this project in the light of the Absorptive Capacity construct as introduced by Cohen and Levinthal (1990) and reconceptualised by Zahra and George (2002). With our sample of five SMEs, we intend to give insights into the progression of the design management absorption. We aim to understand whether these companies were able to absorb design by valueing, acquiring, assimilating, transforming and exploiting new design and design management knowledge during and after the research project. We will also ask whether the newly acquired design management capabilities act as a dynamic capability, meaning that design management can have an impact on the overall resource base of a company. However, due to the relatively short time of collaboration with the companies, we are not able to measure whether the newly acquired design and design management capability sustainably heightens the overall capacity to absorb new knowledge.

[1] The roots of this concept go back to the economic evolutionary theory Nelson, R. R. and S. G. Winter (1982). An Evolutionary Theory of Economic Change. Cambridge Mass., Harvard University Press. which states that the distinctive factor for the successful survival of firms are organisational capabilities or their ability to shape their "routines".

LITERATURE AND THEORY

In 1990, Cohen and Levinthal coined the term absorptive capacity. ACAP is "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (p. 128). Although the APAC construct revolves mainly around the acquisition of technological and scientific knowledge through the R&D activities of a firm, Cohen and Levinthal (1990) also name other business units such as manufacturing, design or marketing as the beneficiaries.

ACAP can best be described through the cognitive structures that underlie learning. Citing insights from cognitive behavioural science Cohen and Levinthal (1990) state, that "prior knowledge confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (p. 128). Building on an already existing memory (of knowledge) reinforces the learning process itself. Thus, new knowledge might be acquired but subsequently not be utilized well because the individual did not already possess the appropriate knowledge to put the new knowledge into context.

Cohen and Levinthal (1990) also argue that the prior possession of relevant knowledge and skills is what gives rise to creativity, "permitting the sorts of associations and linkages that may have never been considered before" (p. 130). Problem solving and learning capabilities are similar, the authors state, although exactly what is learned may differ. While learning capabilities involve the development of the capacity to assimilate existing knowledge, problem-solving skills represent a capacity to create new knowledge. Also knowledge diversity facilitates the innovative process by enabling individuals to make novel associations and linkages. However, an organisation's absorptive capacity is not the achievement of any single individual inside a company, but depends on the links across individual capabilities. New knowledge must actively be exploited by the organisation. To this end, transfer across subunits is necessary as well as a structure of communication with external environments.

Cohen and Levinthal (1990) come up with the notion of the *gatekeeper* that stands at the interface of both the firm and the environment; the gatekeeper also connects the subunits of the firm, because cross-functional interfaces such as the interface between R&D, manufacturing, design or marketing also affect ACAP.

In 2002, Zahra and George proposed a reconceptualisation of ACAP "as a dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage" (p. 185). According to Zahra and George (2002) ACAP can be divided into two subsets: potential (PACAP) and realized absorptive capacities (RACAP). Potential capacity consists of the ability to acquire and assimilate knowledge, realized capacity enables to transform and exploit new knowledge. PACAP makes a company susceptible to learning. RACAP enables the company to leverage PACAP. The authors posit "that potential capacity provides firms with the strategic flexibility and the degrees of freedom to adapt and evolve in high-velocity environments (p. 185)." Referring to Barney's (1991) concept of the resource based view and to the dynamic capability concept of Teece, Pisano and Shuen (1997), Zahra and George (2002) define ACAP as a set of organisational routines and processes, and connect it to the dynamic capability concept by viewing ACAP as a dynamic capability that impacts on the resource base of a company to provide a company with multiple sources of competitive advantage. They suggest that the four organisational capabilities of knowledge acquisition, assimilation, transformation, and exploitation build on each other and influence "the firm's ability to create and to deploy the knowledge necessary to build other organisational capabilities (e.g. marketing, distribution and production)" (p. 188).

Internal or external triggers such as an organisational crisis or performance failure or technological shifts or radical innovations that occur outside the company activate the absorption of new knowledge (Zahra and George 2002). Social integration or the sharing of information contributes to knowledge assimilation and transforms PACAP into RACAP, a process that can be measured by an efficiency factor. Finally, ACAP will lead to sustainable competitive advantage. Following Barney's (Barney 1991) concept that resources need to be valuable, rare, imperfectly imitable and to substitute, ACAP can be described as "knowledge-based capabilities" that will increase innovation and strategic flexibility. RACAP will impact on product and process innovation.

What are resources, capabilities and capacities?

Barney (1991) defines *firm resources* as all assets, capabilities, organisational processes, firm attributes, information, knowledge, etc. "controlled by a firm that enables the company to conceive of and implement strategies that improve its efficiency and effectiveness" (p. 101). While a company might own many different resources, only specific ones will be able to sustain competitive advantage in the sense of the resource-based view (RBV). They must be valuable, rare and imperfectly imitable to substitute (VRIN).

Amit and Schoenmaker (1993) define resources in a similar way as Barney (1991), but they clearly distinguish *capabilities* from *resources*; the former are the firm's capacity to deploy resources. Capabilities are "intermediate goods" which are able to enhance the productivity of a company's resources. Unlike the resources of a company, capabilities are built through exchanging information through the firm's human capital or are even acknowledged by the firm's customer base (e.g. as brand names).

The dynamic capability concept (Helfat et al. 2007) defines *capacity* as the ability to perform a task in at least a minimally acceptable manner. A dynamic capability enables a company to do something different

not necessarily better. However, as to qualify as a *capability* this specific capacity must contain a "patterned" or recurring element. Capabilities are not a one time lucky action or an innate talent. A company needs to be able to apply capabilities "purposefully" which includes some degree of intention and the ability to react to emergent streams of activity. There is also some kind of "search" involved, e.g. in product development this would involve the search for new products to introduce, and with this comes "decision making" whether or not to enhance current assets and capabilities.

What are design and design management resources and capabilities?

Many design management scholars described design as a strategic resource (Kotler and Rath 1984; Cooper and Press 1995; Bruce and Bessant 2002; Borja de Mozota 2003) yielding various results if deployed properly. Kotler and Rath (1984) offer two categories to describe the *design capabilities* of a firm: *design sensitivity* and *design management effectiveness*. The authors make a distinction between the use of design and the use of design management, a distinction that is often blurred if made at all. *Design sensitivity* assesses to which extent design is part of the marketing decision making process, to which extent design is being utilised in product development, in the design of environments, of information and corporate identity.
Design management effectiveness is concerned with the overall orientation of the design staff and questions such as: Are designers operating as authors and neglecting the needs and wants from the marketplace or do the design solutions start with the awareness of customer needs? Or: Are there close working relationships between the design staff and marketers, sales, engineering and research?
Chiva and Alegre (2009)[2] propose the following design management skills (or capabilities): *Basic skills* include managing activities of the design process such as designing for high quality and manufacturability or designing and launching products faster. *Specialised skills* entail abilities to manage specialised activities such as cost estimation of new products, ability to use the latest computer-aided design tools, testing manufacturability of new products during the design process and finding people with excellent design skills. Chiva and Alegre (2009) mention *involving others* such as customers and suppliers in the design process and getting new product ideas from customers as a design management skill, and *organisational skills* to change the way things are traditionally done in a company; the latter also entails getting different functions in the firm to work together or replacing sequential with concurrent design.
Bruce, Cooper and Vasquez (1999) name three central design management *skills* for SMEs: *sourcing* the right designer for a project, *briefing* him/her and *evaluating* the results of the design projects. Perks, Cooper and Jones (2005) describe the following design skills used in new product development processes: *functional design skills, integration design skills and leadership skills.*

CRITICAL FRAMEWORK

We will use design as a transformer (Borja de Mozota 2006), as one of the building blocks of the Design Management Absorption Model (see Figure 1) and reconceptualise this power as (potential) *design resource/s*. As long as a company does not recognise the value of design resources for its business, these resources will lie dormant. In this paper, we define *design management capabilities* as organisational capabilities to use these *design resources* to achieve competitive advantage. The absorption process and design management capability building can be supported by the use of *design approaches* such as user-centred design, and *design tools* such as a customer journey or a brand persona as well as by sustained collaboration with external designers.
In our Design Management Absorption Model, following Zahra and George (2002), we list the four organisational capabilities of acquiring, assimilating, transforming and exploiting. The *acquisition phase* consists of recognising the potential of design as a resource and identifying specific design contributions to a company's bottom line. During this phase, it is of utmost importance that design knowledge can be related to prior knowledge or company rationale. Once this has been done, specific design resources will have to be assimilated, transformed and exploited.

[2] Chiva and Alegre (2009) use a skill set developed by Dickson et al. Dickson, P., W. Schneider, et al. (1995). "Managing Design in Small High-Growth Companies." *The Journal of Product Innovation Management* **12**: 406-414., which derived these categories empirically from 200 telephone interviews with CEOs of the small and medium sized high growth company sector in the US.

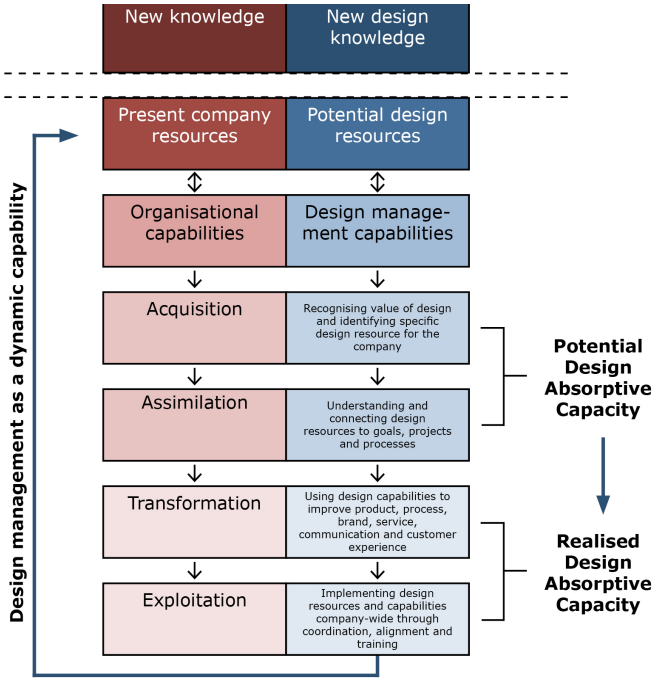

Figure 1: Design Management Absorption Model

Assimilation will entail a deeper understanding of the new design knowledge by connecting it to company goals, projects and processes. During the *transformation* phase, the new design knowledge has to be deployed effectively through building *design management capabilities* and using *design tools* to improve all customer touch points such as products, brands, services, communication, or processes such as NPD or innovation processes. The *exploitation* will involve the company-wide implementation of the design resources through integrating design into processes, coordinating functions, aligning core values, training the staff etc.
Based on Zhara and George (2002) in our model we suggest the same distinction between Potential Design Absorption Capacity and Realised Design Absorption Capacity; much like them we state that the development of potential design management capabilities does not guarantee the successful transformation and exploitation of these capabilities. Potential resources will need to be changed into specific *design management capabilities* that include a "patterned element" (Helfat et. al. 2007), a capacity to repeat certain actions.
Once design as a potential resource has been recognised, assimilated, has transformed business routines and has been exploited successfully, design and design management capabilities can impact on existing company resources. Ultimately, design management can act as a *dynamic capability*, change the company on a deeper level and improve its overall competitiveness and strategic flexibility.

DATA AND METHODS

To explore companies' capability to acquire, assimilate, transform and exploit design resources, an action research project was conducted followed by an evaluation of results and company lessons. The sample comprised two companies from the service sector (including a health clinic) and three firms from the manufacturing sector. At the beginning, reseachers and companies assessed the strengths and weaknesses of the present use of design (as evident in products, services, communication, brand and overall customer experience) and current threats and opportunities from the environment[3]. Based on the initial analysis, design strategies and (innovative) design projects for each company were identified. Researchers worked as "facilitators who catalysed the process within the subject company" (Platts 1993) by introducing different frameworks to support design absorption. During five workshops with each company, which stretched over a period of seven to seventeen months, several design and design management approaches and tools were introduced such as customer journeys, experiential research methods (e.g. using an ageing suit to understand the experience of patients with the way-finding system of the clinic), user-centred design processes etc. with the end to support the acquisition and assimilation of design capability. Also, the sourcing and briefing of and the communication with external designers were facilitated where design work was needed.
Six to nine months after these series of workshops took place, an evaluation was conducted to understand whether or not the companies had carried out their projects and how deeply the companies had absorbed design management knowledge. Semi-structured interviews were arranged with each company, aiming to find out how they made use of design and design management since the action research phase, whether their perception of design had changed and - last but not least - how the specific design projects had been implemented. The results from the research are presented in three ways: firstly, in a descriptive way. Table 1 (see appendix) gives an overview over the design projects, the design activities carried out, the design management capabilities developed, the tools used, and the results of the projects. Secondly, we analysed the absorption process of each company through the stages of acquisition, assimilation, transformation, and exploitation; Table 2 (see appendix) rates the progression of the absorption process at each stage and analyses the success of the absorption process in regard to the impact it had on the overall resource base of the company. Thirdly, the central findings are summarised and discussed.

[3] In prior research the "Design Management Travel Guide" (Acklin and Hugentobler 2008), a visual design management assessment tool based on the Danish concept of design maturity has been developed. One aim of our research project was to test and refine this tool (see also Acklin 2010). Assessment results from the DM Travel Guide can include desirable outcomes in the field of their offerings as well as the positioning of the company.

RESULTS

Table 2 indicates that one company succeeded in realising ACAP, two are on the way of doing so and two companies failed. One firm from the manufaturing sector succeeded completely in absorbing and integrating new design knowledge. At the beginning of the workshops with the researchers, the CEO doubted that design is relevant in his field at all. However, in cooperation with the industrial designer, the company simultaneously managed to cut production costs, to install a modular architecture, and to improve ergonomics and product semantics of the machine. Furthermore, by exploiting design and design management the company moved from a mechanical engineering company, who have been constructing and selling machinery to a system provider, who now offers innovative services based on a well-designed machinery as a core. The company made use of design as a differentiator (form giving of new product), as an integrator (integration of various types of expertise) and as a transformer (transformation of the company); the result is "good business" (Borja de Mozota 2006) as an (intended) 10 % growth of the profit margin and a 25 % reduction of production cost indicates. The CEO also pointed out that the technological know-how the company possesses has been made more visible and tangible to customers and stakeholders with the help of design. One year later, with a new project the company continued its cooperation with the designer. The organisational structure was changed to permanently integrate a design function into the innovation process. The changes of the resource base indicates that design management has acted as a dynamic capability.

Also the company from service sector was able to absorb new design management knowledge in a way that it impacted on the overall resource base of the company; a new customer experience strategy became part of the overall strategy of the company.The use of tools such as the customer journey and the brand persona resulted not only in a re-design of most communication media such as the logo, business documents and website, the company also reworked and refocused single services, all of the service portfolio and their overall customer experience strategy. As a result, since the end of the project, the number of unsolicited enquiries from customers increased. The company still uses some of the design tools to check whether it keeps to its customer experience strategy. However, it is not completely clear as to how the company will be using these tools under different circumstances or whether they will stick to what has been developed together with the research team.

The health care organisation made some progress on its absorption of new user-centred design knowledge. However, changes in the responsibility for the design project and internal pressures from the head office slowed down the absorption process to an extent nearly bringing it to a stop. While customer-orientation was part of the culture of the clinic before, certain design tools such as the use of an ageing suit by some members of the board made a strong impression on the perception of human-centred approaches. The clinic is planning to use this method again.

In two cases the researchers observed no design absorption process in the company. In one of the cases this was due to external obstacles. To increase visibility and market power the manufacturer aimed to become independent from the economic department. During the action research period, a corporate identity and branding project, a strategy to open up new market segments, and eventually to offer new proprietary products was developed. The manufacturer handed in a business plan to the local authorities and has been waiting for its decision ever since. Thus, the researchers had little evidence to conclude that ACAP had been realised. In the second case of no RACAP, the transformation and exploitation of design management capability was due to internal obstacles; instead of developing new business opportunities and eventually a new product, questions on how the succession of one of the CEOs should be handled took central stage. One team member displayed interest in the design and design management tools, but she was not able to implement them because of her position in the company. In this case, potential capacity was given, but a lack of power to transform and exploit the new knowledge inhibited the realisation of the capacity.

DISCUSSION

Picking up on the experience of the design support community, our own experience in applied research projects (Acklin and Hugentobler 2008; Acklin 2010) and exemplified again in this project, SMEs first need to be sensitised to the value of design as a strategic resource before they are ready to consider it as complementary knowledge. The acquisition phase is supported by recognising the potential financial gains or other results coming from the use of design. E.g. the CEO of the manufacturing company was convinced of the benefits of working with a designer after hearing that the latter would be able to reduce production cost. The presence of *gatekeepers* as described by Cohen and Levinthal (1990) is another facilitating factor right at the beginning of the process as well as in later stages. In the ACAP construct the gatekeeper is seen as an enabler of learning and knowledge acquisition; in former design management literature this position is often refered to as design champion (Dumas and Mintzberg 1989; Borja de Mozota 2003).

Another vital step in the absorption of new design knowlegde is the movement from the assimilation to the transformation and, finally, the exploitation stage: Tools such as brand personas, customer journeys or design processes can support the development of design and design management capability which then act as "intermediary" goods to change the overall resource base of the company. To enable teams in SMEs to use these tools facilitates the development of a shared language for the successful cooperation with external designers who already use these tools; they also convert

tacit (design) into more explicit or tangible forms of knowledge. The exploitation of new design knowledge can lead to a change of the resource base of the company and, thus, design management capabilities can act as a dynamic capability. However this is not necessarily so. The exploitation can remain an ad hoc event with no recurring pattern.
The Design Management Absorption Model is a valuable contribution to the design support community as it provides the theory and a tool to measure design integration in companies with little or no prior design experience. It can also be used by the design practice working with SMEs or by the companies themselves. The model also connects design management to the dynamic capability concept as formulated by Teece, Pisano and Shuen (1996) and our research was able to provide evidence that design management can change company resources and, thus, act as a dynamic capability. However, this is only a start. More empirical research is needed to study the longterm effects and impacts of design absorption on company resources, their dynamic capability and overall absorptive capacity.

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APPENDIX

Table 1: Summary of design projects, activities, capabilities, tools and approaches, results per company

	Company 1 Service company	**Company 2** Manufacturer B2B (textile print)	**Company 3** Healthcare	**Company 4** Manufacturer B2B (engineering)	**Company 5** Manufacturer B2B (textile industry)
Design project	Optimisation of touch points and improvement of customer experience (incl. services)	Optimisation of innovation process and organisation; Exploration of new business opportunities (development of a B2C product)	Optimisation of way-finding system to and inside clinic (entrance hall)	Introduction of industrial design in NPD process, development of services and business model con-nected to new product	Development of corporate identity, corporate design, brand values and brand name
Design activities	Redesign of corporate design, communication media, and internet site (through designer); partial re-design of single services and whole service portfolio (through company)	Analysis of existing innovation process and organisation; development of blueprint for new innovation process and organisation; exploration business case for potential B2C product	Evaluation of touch points of patient's customer journey (incl. mirroring touch points against brand values); analysis of way-finding system; concept development for improved way-finding system	Design of machine based on engineering prototype; branding machine; deve-lopment of services, internet site, partnerships, and connecting elements to a system of offerings; visualisation of system	Development of an overall design strategy for organi-sation; development of brand values as a basis for the corporate identity; renaming the organisation
Design capabilities	Design strategy building; using human-centred design models (e.g. analysis of customer journey); using storytelling elements for branding	Design strategy building; designing innovation process, portfolio and organisation (structure, human resources); exploring new business opportunities	Design strategy building; using human-centred design models (e.g. analysis of customer journey); branding using storytelling elements	Design strategy building; improving NPD through integration of functions; human-centred design models (e.g. analysis of customer journey); visualisation	Design strategy building; using storytelling elements for branding and corporate identity building
Design tools and approaches	Design Management Travel Guide*; Brand Personas; Briefing; Customer Journey	Design Management Travel Guide* Design-driven innovation process as a tool	Design Management Travel Guide*, Customer Journey, Shadowing, Experiential Research (Aging Suit)	Design Management Travel Guide*; Briefing; system's and information design	Design Management Travel Guide*, Brand Personas, Naming, Briefing
Results	More unsolicited requests from customers	Employment of a design manager	Single adjustments of details of way-finding system; revision of customer entry forms	Form giving and cost reduction manufacturing of approx. 25%); new (systemic) business model	none

* The DM Travel Guide is a tool that has been developed in prior research and that can be used to assess current design use and capability of a company and opportunities and threats from the environment. One of the aims of this research project was t test the prototype of this tool

Table 2: Evaluation of interviews about Design Absorptive Capacity (in retrospect)

	Company 1 Service company	**Company 2** Manufacturer B2B (textile print)	**Company 3** Healthcare	**Company 4** Manufacturer B2B (engineering)	**Company 5** Manufacturer B2B (textile industry)
Acquisition	Recognition of value of design (some questions on nature of design mgmt.)	Recognition of nature of innovation process; design as a driver of new business opportunity	Recognition of human-centred design models for designing relationship with customers/patients	Recognition of value of design in all company areas	Recognition of design as something more complex than assumed
Progression bar*					
Assimilation	Understanding design and design mgmt. contributions to company goals (customer experience) results in design project development	Understanding problems with then current innovation process, innovation organisation and attributed human resources	Understanding of problems with way-finding system and understanding contribution of design results in design project	Understanding of contribu-tion of industrial design to form giving, ergonomics and cost reduction of new machine; of system's and information design to business model generation and communication	Understanding of contribution of design to corporate identity building results in naming and corporate identity project
Progression bar*					
Transformation	Cooperation with external designer; use of design tools for analysis and synthesis for design project through company	Employment of design manager (successor to leaving CEO)	Formulation brief for concept development to optimise way-finding system, sourcing designer; revision of customer entry forms.	Formulation brief for design of engineering prototype, sourcing designer; use of design tools such as visualisation, customer journey etc.	None (external obstacle to progression of project)
Progression bar*					
Exploitation	Use of design tools (e.g. customer journey as blueprint for sustained adaption of services; brand persona to outline prospective CI)	None (internal obstacles due to change in leadership and human resources)	Partial adoption of user-centred perspective for management decisions; synergy between human-centered design view and change in cultural values and leadership	Following product was developed with industrial designer right from the start; use of visualisation for internal communication	none
Progression bar*					
Impact on company resources	Inclusion of customer experience strategy in overall business strategy	None	Reinforcement of human-centered view	New organisational structure (with design); adaptation of corporate design	none
Progression bar*					

* Incremental progression by 20 % increasing from left to right

Design Management Absorption Model – A Framework to Describe the Absorption Process of Design Knowledge by SMEs with Little or No Prior Design Experience

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Keywords: Design management in SMEs, absorptive capacity, design and design management absorption process and model

The introduction of new design knowledge or design resources in companies with little or no design experience has been at the core of design support programmes in different countries. Scholars investigated the use of design and identified different design and design management capabilities to deploy design effectively in companies of all sizes. However, how design and design management capability is built in SMEs with little or no prior design experience is insufficiently investigated. Based on the absorptive capacity construct from the broader field of innovation studies, this paper proposes that the absorption of new design knowledge or resources is an organisational learning and capability building process. It introduces a comprehensive design management absorption model that includes design and design management capabilities that enable design absorption in SMEs with little or no prior design experience as well as indicators to measure the progress of absorption. The model allows for analysing the process companies go through when using design as a strategic resource for the first time.

Introduction

Using design as a strategic resource to differentiate products, manage design projects more effectively or build brand value has been common since the mid-sixties (Farr, 1965; Kotler & Rath, 1984; Lorenz, 1987; Topalian, 1979). Since then, scholars have been intent upon defining and positioning design management as a management function in its own right. Design management has been described from different perspectives such as definitions and goals (Blaich & Blaich, 1993; Farr, 1965; Gorb, 1990b), organisational place and level (Borja

de Mozota, 2003; Cooper & Press, 1995), people deploying design (Gorb, 1990b), their management and leadership responsibilities (Turner & Topalian, 2002), or their tasks (Topalian, 1979). Design management has been viewed as a process from the analysis of customer needs through to the market launch of new products or services (Topalian, 1979); it has also been conceptualised as a coordinator between functions, departments and an integrator of stakeholders (Bruce & Bessant, 2002).

Other than marketing, which developed at around the same time (Gorb, 1990a) design management failed to be widely adopted as a management function (Sun, Williams, & Evans, 2011). Only lately, the debate on design thinking and the ensuing inclination of renowned companies such as P&G (Martin, 2009) to include design knowledge into their value-creating and innovation processes has sensitised more organisations to design. Although the notion of design thinking is ambiguous and has provoked mixed reactions in the community of design practitioners as well as design scholars (Hassi & Laakso, 2011) the "hype" has mostly been restricted to larger organisations.

Many SMEs are still unaware of design as a strategic resource; some because they are technology-driven and are making "silent design" decisions (Gorb & Dumas, 1987) or doing engineering design (Blaich & Blaich, 1993); some because barriers such as limited human and financial resources, less formal or nonexistent product development and innovation processes (Fueglistaller, 2004), lack of access to design resources (Cox, 2005) or poor design understanding (Moultrie, Clarkson, & Probert, 2007) etc. make it difficult to integrate a design management function.

With national design programmes, design councils or other knowledge brokers such as universities, a shift towards engaging with SMEs can be observed because they represent most organisations in Europe by number[1]. Regional design centres have been facilitating matchmaking between designers and SMEs or launching design support programmes. There has been a move towards more substantial knowledge transfer including the business and leadership role of design and the promotion of innovative tools as well as design management methods (Boult, 2006).

However, there are many reasons for the gap between design and management. To acquire and to manage new design knowledge can be difficult (Bruce & Jevnaker, 1998) - for large firms as well as for SMEs. Because:

1. Design knowledge has rarely been part of management education and, thus, is an alien resource to many managers (Boland Jr. & Collopy, 2004; Jevnaker, 1998; Martin, 2009) as well as to engineers (Jahnke, 2009).
2. Design is an "experience good" (Commission of the European Communities, 2009). Confidence in design as a resource grows, once there have been positive experiences with and observable effects of the use of design (Perks, Cooper, & Jones, 2005). Furthermore,

[1] http://ec.europa.eu/enterprise/publications/index_en.htm

design knowledge is personalised (in form of individual design expertise) and heterogeneous (Jevnaker, 1998).

3. A "design attitude" (Boland & Collopy, 2004) has some irritating "ingredients" for management teams such as an insistence on fluid and iterative processes of searching, experimenting and prototyping, zooming in and out of the problem while maintaining a holistic view (Conley, 2004), accepting high levels of uncertainty (Jevnaker, 1998), while evaluating multiple alternatives (Conley, 2004), and being led by a human-centred design ethos stressing empathy with user needs as a starting point for innovation (Brown, 2008).
4. Also the tacit dimension of design knowledge that is embodied in products as well as in people has been mentioned (Jevnaker, 1998).

From these few observations it can be concluded that starting to use design as a strategic resource involves a learning process on the side of SMEs on how to tackle and to manage this new knowledge or strategic resource. While, as stated before, much of the design management literature has focused on definitions, goals, responsibilities and tasks, little attention has been given to the question of how companies with little or no prior design experience build the capabilities to execute design management. A task-based or functional perspective of design management describes how design management operates in a company on a day-to-day basis. A focus on capabilities and how they are built, however, uses a perspective of organisational learning and the configuration of resources.

Based on the *absorptive capacity construct* (Cohen & Levinthal, 1990; Zahra & George, 2002) from the broader field of innovation studies, this paper introduces a model that describes the absorption of design knowledge as an organisational learning process of *acquisition*, *assimilation*, *transformation* and *exploitation* together with indicators to assess the success of the individual phases of the process. Design management and design leadership capabilities are viewed as organisational capabilities that have the potential – on one hand – to create competitive advantage, and – on the other hand – to change the company to a dynamic and flexible organisation. The outcome of the design and design management absorption can be the *dynamic capability* of a company, a concept that has been described in strategic management studies (Helfat et al., 2007; Teece, Pisano, & Shuen, 1997). More precisely, design management itself can act as a dynamic capability, which is even more probable in SMEs with short communication channels and flexible structures (Fueglistaller, 2004).

In prior applied research (Acklin, 2011) a first Design Management Absorption Model (DMAM) to *evaluate* a company's absorption processes was developed and the progress of five SMEs was analysed with it. In this paper, a more comprehensive version will be presented; it includes design management and design leadership capabilities that enable design management absorption together with indicators to measure the progress of the absorption process in SMEs with little or no prior design experience.

The main goal of this paper is the presentation of the theory behind the DMAM. It firstly reviews and extends the theory that led to the model; secondly, based on prior research and

preliminary insights from an on-going applied research project, further observations concerning absorption processes and obstacles, as outlined in the model, are described.

Literature and definitions

The key concepts to understand design management as an organisational capability yielding competitive advantage and strategic flexibility can be traced back to Edith Penrose's "The theory of the growth of the firm" (1959) and to ensuing concepts of strategic management such as the resource-based view (RBV) or the dynamic capability construct (DC). It is also needed to take a look at the absorptive capacity (ACAP) construct of the innovation studies that conceptualises innovation as a result of organisational learning and capability building. These core concepts include answers to the questions: What are resources? What are (organisational) capabilities? How do organisations absorb new knowledge and build design management capabilities? And how do they create competitive advantage?

Organisational resources, capabilities and capacities

A company can be viewed as a bundle of productive *resources* with an "autonomous administrative planning unit" (Penrose, 1959, p. 14) or management team deciding how to deploy them to make a profit. These resources can be physical such as plants or equipment, but they can also be intangible such as the human resources available to the firm. However, "it is never resources themselves that are the 'inputs' in the production process, but only the services that the resources can render" (p. 22). Services are seen as an "activity" (p. 22) to put these resources at work. And: "As we shall see, it is largely in this distinction that we find the source of uniqueness of each individual firm" (Penrose, 1959, p. 22).

Penrose's ideas had little impact on the classical economic theory of her time (Pitelis, 2009), which mainly described the firm as interplay between market demand and a company's offer; but some 40 years later these ideas were picked up by the resource-based view and by the dynamic capability construct (DC) explaining sustained competitive advantage. The resource-based view (RBV) defines resources as all assets, capabilities, organisational processes, firm attributes, information, knowledge etc. It's resources that are valuable, rare, imperfectly imitable and non substitutable that create a competitive advantage for a company (Barney, 1991).

On top of that the DC emphasises the notion that companies need "dynamic capabilities" to exploit existing internal and external firm-specific competences to address changing environments (Teece et al., 1997). Companies should *dynamically* adjust to the changing business environment of a "Schumpeterian world" and strategic management should be capable to appropriately adapt, integrate, and reconfigure internal and external organisational skills, resources, and functional competences to match the requirements of a changing environment (Teece et al., 1997).

In evolutionary theory, Nelson and Winter (1982) came up with the term "routines" – certain "regular and predictable behavioural patterns" of firms (p. 14) – comparing routines to the

role genes play in biological evolutionary theory. They are persistent, heritable, and selectable. Nelson and Winter (1982) anticipated the critique made by authors of the RBV who warned against the danger that resources might become sticky, meaning that firms can get stuck with what they have and might have to live with what they lack (Teece et. al. 1997), unless they develop the dynamic capability to continuously extend their resources.

Teece, Pisano and Shuen (1997) stress the point that "skill acquisition, the management of knowledge and know-how, and learning become fundamental strategic issues" (p. 514). Dynamic capabilities are about change, entailing the process of identifying an opportunity, formulating a response to it and purposefully implementing a course of action (Helfat et al., 2007).

Amit and Schoenmaker (1993) make a distinction between *resources* and *capabilities* that echo the one mentioned above by Penrose's (1959): *Resources* are stocks of "available factors that are owned or controlled by the firm" (p. 35). *Capabilities* are the capacity to deploy them. Like resources these capabilities are firm specific and are developed over a longer period of time through learning processes. They are information-based, tangible and intangible processes and they "can abstractly be thought of as 'intermediary goods' generated by the firm to provide productivity of its resources, as well as strategic flexibility and protection for its final product or service" (p. 35).

A *capacity* is the ability to perform a certain task in a minimally acceptable manner (Helfat et al., 2007). To qualify as a capability the capacity to execute a specific task needs to have a *patterned element*, a company needs to be able to repeatedly perform a certain task in a minimally acceptable manner.

Design resources, design management capabilities and design capacities

Also design can be viewed as a bundle of resources. Based on Barney's (1991) definition of company resources, design can be regarded as a resource in several ways: Design is a process and can be viewed as an organisational "routine" (Nelson, 1982); design is a specific form of knowledge (2011); design can be an asset, e.g. in form of an in-house design team or a design alliance (Bruce & Jevnaker, 1998); and it is a set of design management capabilities ("intermediary goods") to enable the deployment of design resources (Gorb, 1990b) in a way to harvest the benefits "these services can render" (Penrose, 1959).

Borja de Mozota's (2006) defines three key characteristics of design resources or of the "powers of design": 1. Design is a differentiator (of products, services etc.). 2. Design is an integrator (of different functions and team members). 3. Design is a transformer. 4. Design is "good business" through increased ROI, higher margins, revenues, market share etc., which describes the results of the use of design in a company.

In past research many other design management scholars (Bruce, Cooper, & Vasquez, 1999; Chiva & Alegre, 2009; Dumas & Whitfield, 1990; Kotler & Rath, 1984; Perks et al., 2005) investigated the use of design and identified different design and design management

capabilities to deploy design effectively in companies of all sizes. Some of this research extracts specific design capabilities from product development processes (Perks, Cooper & Jones, 2005) or from the design management use of design-oriented companies (Borja de Mozota, 2006).

However, the terms task, skills or capabilities are used ambiguously. They mostly describe a specific design management function or person and his/her tasks and abilities. The shift to viewing design management as an organisational capability is a relatively new one. Jevnaker (1998) lists the following component capabilities in organising design and its management: 1. Resourcing capability, the ability to acquire and manage profitable design resources. 2. Combinative capability, the ability to configure design resources. 3. Organisational learning capability, which is an absorption capability. 4. Innovation capability. 5. Design-strategic capability, capability to integrate design into business strategy. 6. Protecting capability of design-based advantages (p. 21).

Absorptive capacity and design complementarity

Critical to innovation or to the development of new offerings is the capacity of companies to absorb new external knowledge. According to Cohen and Levinthal (1990) absorptive capacity (ACAP) is "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (p. 128). Although the APAC construct, in its beginning, has been focusing on the acquisition of technological and scientific knowledge through the R&D function of a firm, Cohen and Levinthal (1990) also name other business units such as manufacturing, design or marketing as the beneficiaries.

Referring to the resource-based view (Barney, 1991) and to the dynamic capability concept (Helfat et al., 2007; Teece et al., 1997), Zahra and George (2002) re-conceptualise ACAP as a set of organisational routines and processes, and connect it to the dynamic capability concept by viewing ACAP as a dynamic capability that impacts on the resource base of a company to provide a company with multiple sources of competitive advantage. They suggest that there are four organisational capabilities: knowledge acquisition, assimilation, transformation, and exploitation.

Drawing on insights from cognitive behavioural science, Cohen and Levinthal (1989, 1990) state that prior knowledge helps to value new information and to assimilate it. In spite of an already existing memory (of knowledge) new knowledge might be acquired, but often not utilized well because individuals do not possess the appropriate knowledge to put the new knowledge into context. Zahra and George (2002) integrate this insight from cognitive behavioural science by distinguishing potential capacity (PACAP), the ability to acquire and assimilate knowledge, from realized capacity (RACAP), the ability to transform and exploit new knowledge. While PACAP makes a company susceptible to learning, RACAP enables the company to leverage PACAP.

It's a common experience of design practitioners and of past and ongoing applied research of the author of this paper (Acklin, 2010; Acklin, 2011; Acklin & Hugentobler, 2008) that

SMEs will reject or often abandon the idea of integrating design into their innovation and new product development projects early on. This is explained by time or money constraints by the SMEs, but often points to a deeper chasm between engineering and design or management and design values and their ways of "handling things". This points to the question, whether design knowledge is more difficult to absorb than other forms of knowledge.

An empirical study with French companies from the clothing and the construction business researched the difference of design knowledge from engineering or marketing knowledge during the absorption process in new product development and came up with an enlightening list of typical attributes (Abecassis-Moedas & Mahmoud-Jouini, 2008): 1. Companies perceived design as related to an individual designer/architect rather than embedded to a collective as in their firms. 2. Design relies strongly on tacit rather than explicit knowledge, the latter being more present in e.g. manufacturer or retailer's knowledge. 3. Designers are inclined to use divergent thinking rather than convergent. Designers rather strive on creative exploration, while e.g. engineers work on well-specified problems. 4. Designers keep to a peer-orientation giving more importance to their peer's opinions than to the one's commissioning the project.

While the gap between design and engineering or management and the difficulty to relate design knowledge to prior organisational knowledge can be a problem, the complementarity between manufacturing and design or retail and design knowledge can be a critical aspect for the successful absorption process. Abecassis-Moedas and Mahmoud-Jouini (2008) come to the conclusion that - if the source knowledge as represented "through the archetypical figure of the architect or the fashion designer" (p. 474) is at the same time related and diverse and if it is combined effectively with the recipient's knowledge (firm) - positive effects can be observed on NPD performance such as process efficiency (cost) and product effectiveness (quality).

On the recipient side, however, an organisation's absorptive capacity is not the achievement of any single individual inside a company, but depends on the links across individual capabilities. New knowledge must actively be socialised and shared (Zahra & George, 2002) in order to be exploited by the organisation.

Conceptual model

Based on innovation and design management studies, the Design Management Absorption Model (DMAM) conceptualises design management as an organisational capability that facilitates the absorption of new design resources and leverages design knowledge to achieve competitive advantage. The absorption process and design management capability building can be supported by the use of *design approaches* and *tools* as well as by (sustained) collaboration with external designers. If the absorption of design management and design management capabilities move from potential to realised absorptive capacity through socialisation and diffusion of design knowledge inside the company, design management can

yield external outcomes as well as internal effects such as strategic flexibility and, ultimately, act as a dynamic capability (see Figure 1).

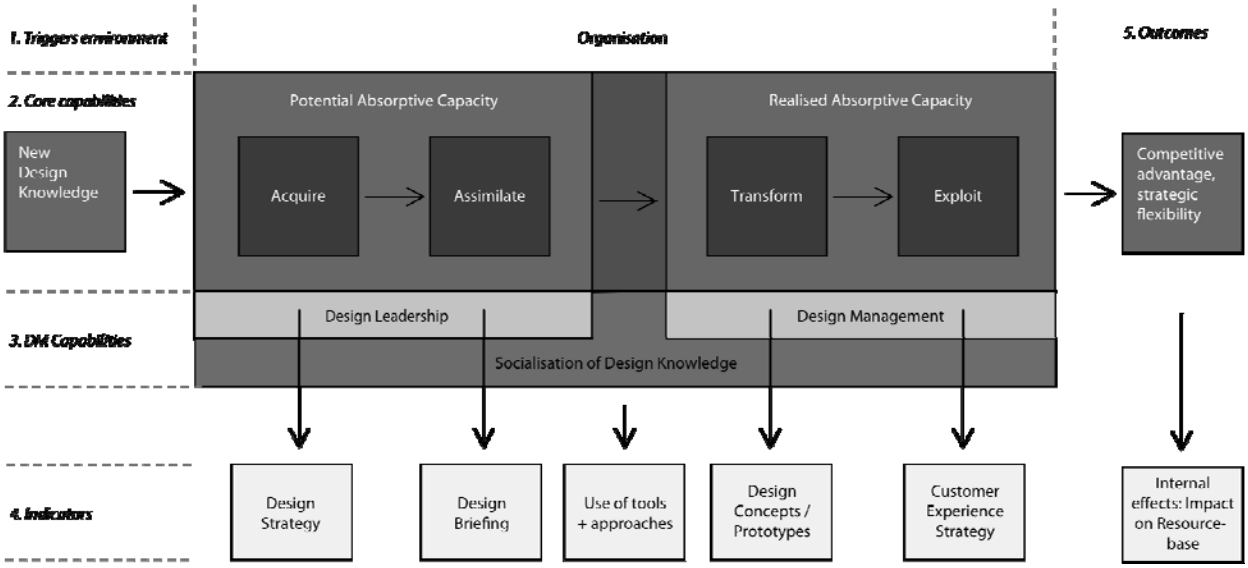

Figure 1: Design Management Absorption Model (based on Zahra & George, 2002)

1. Triggers

One of the central questions is, how new design knowledge finds its way into the company. According to Zahra and George (2002), internal or external triggers such as an organisational crisis or performance failure or technological shifts or radical innovations that occur outside the company activate the absorption of new knowledge. It has also been mentioned that the firm's motivation is key to the willingness to absorb new knowledge (Abecassis-Moedas & Mahmoud-Jouini, 2008).

2. Core capabilities of design knowledge absorption

Following Zahra and George (2002), design management absorption is divided into the four organisational capabilities of *acquiring*, *assimilating* (PACAP), and *transforming* and *exploiting* (RACAP) new design knowledge. *Acquisition* consists of identifying a specific design contribution to the company's bottom line. *Assimilation* entails a deeper commitment to the new design knowledge by combining it to engineering or marketing processes and projects and by establishing to work with either complementary sources of design knowledge. During *transformation*, the new design knowledge has to be deployed effectively to improve offerings such as products, brands, services, communication, or efficiently to manufacturing or innovation processes. *Exploitation*, involves the company-wide implementation of design resources through integrating them into relevant processes, coordinating functions, aligning core values, training staff etc. and through delivering a coherent customer experience at all touch points. Since absorption processes mainly take place during concrete work assignments and projects, the DMAM follows a prototypical development process.

3. Design Leadership and Design Management Capabilities

In this paper a distinction between strategic or leadership and operational design management capabilities is made (Borja de Mozota, 2003; Cooper & Press, 1995; Topalian, 1979; Turner & Topalian, 2002). This distinction is useful to connect the DMAM to SMEs, which are strongly controlled by the owner/founder of the company (Fueglistaller, 2004; Mintzberg, 1979). He or she is the "gatekeeper" as described by Cohen and Levinthal (1990) and determines whether design knowledge classifies as useful or not. In the model, acquisition and assimilation are related to design leadership capabilities and transformation and exploitation to design management capabilities, although the notions blur into each other (Turner & Topalian, 2002); this also because of the fact that owners of SMEs are involved in strategic as well as in operational work (Fueglistaller, 2004). The DMAM refers to design management capabilities as described by different authors (Jevnaker, 1998; Perks et al., 2005; Topalian, 1979) putting them into an order suitable for the absorption process and complementing or omitting elements to match the situation of SMEs (Table 1).

Acquire	Assimilate	Transform	Exploit
Design Leadership capabilities		Design management capabilities	
Defining hypothesis for new business opportunity; formulating a design strategy as part of company strategy (Jevnaker, 1998)	Sourcing design expertise and combining it with in-house team expertise (Jevnaker, 1998); briefing of external partner (Perks, Cooper, & Jones, 2005); contracting and allocating resources	Facilitating project development (Topalian, 1979); managing different stakeholders out- and inside company	Aligning corporate values and project outcome; coordinating functions, processes etc. to achieve coherent customer experience

Table 1: Design leadership and management capabilities connected to design management absorption capabilities

Socialisation of design knowledge

Design knowledge in the context of this paper entails design processes, approaches such as human-centeredness, visualisation, experimentation, prototyping, etc., and tools as well as an attitude towards creation of innovative solutions. While the cooperation with external designers will trigger a learning process, SMEs can absorb design knowledge themselves. Jonas (2010) re-conceptualises the notion of design in the following way: "Design is a *process*, which uses *knowledge* to generate new *forms* and new *(forms of) knowledge"* (p. 1). Design knowledge contains tacit dimensions (Rust, 2004) using tools such as future customer personas, user scenarios, or customer journeys to convert tacit into explicit knowledge (Nonaka, 1994). Since SMEs are close to their customers they have a wealth of tacit knowledge to inform designer's solutions once it is made explicit. In addition, the use of

these tools by company members is a vehicle to introduce how designers work, to socialise design knowledge throughout the company.[2]

4. Indicators

Indicators are evident outcomes to support the description and measurement of the progression of the design management absorption process. The first indicator is an often-sketchy (nevertheless explicit) *design strategy* or *hypothesis* of where a process and the absorption of design knowledge connected to it should take the enterprise. It triggers search and knowledge creation activities to understand the envisioned business opportunity. A *design briefing*, the second indicator, constitutes the assembled knowledge at this point in time, the direction and the scope of the design work. The briefing can be in a written or oral form and represents the condensation of strategic intent communicated to and re-worked by designers. Indicators of a successful collaboration with a complementary design knowledge source are *concepts* and *prototypes* of future product / service outcomes. Finally, an indicator for a holistic understanding of design management as a multi-layered activity to achieve touch point orchestration is a *customer experience strategy* that might initiate a long-term transformation and exploitation of design knowledge throughout the company.

5. Outcomes

Zahra and George (2002) described ACAP "as a dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage" (p. 185). The same can result from absorbing design and design management knowledge if design resources are connected to value creating process of SMEs. Consequently, an external outcome of absorbing new design knowledge can be competitive advantage achieved through improved offerings and customer experiences. There can be an internal outcome as well, which might be even more important because it has the potential to change a firm into a dynamic and flexible entity. Although scholars mention that measuring dynamic capability is difficult (Ambrosini & Bowman, 2009; Helfat et al., 2007), the DMAM proposes that an indicator for design management as a dynamic capability is a change of the resource-base of a company such as altered innovation processes or company structures that include designers or design managers. There also needs to be a "patterned element" (Helfat et al., 2007) in the way a company handles strategic as well as operational routines.

Observations from application

Based on findings from prior research (Acklin, 2011) and preliminary insights from an on-going applied research project, the last part of this paper introduces additional observations concerning absorption processes and obstacles as outlined in the model. The *valuation* of design as a complementary form of knowledge is the very first part of the absorption process. However, many stereotypes of design hinder the *acquisition* of new design knowledge in

[2] See also the notion of "design infusion" as describe by (Dumas & Mintzberg, 1989).

SMEs, before the possibility for a purposeful form of acquisition opens up. Knowledge brokers such as design support programmes or knowledge transfer programmes of universities play an important role in the sensitisation of SMEs together with company peers, which already use design and demonstrate its effectiveness.

Has the entry barrier been overcome, the *acquisition* of design knowledge is supported by making design a strategic issue and raising it from a styling or problem-solving activity to the level of company objectives. During this phase, it is important that design knowledge can be related to prior knowledge or company rationale, e.g. to brand strategy, to product development goals etc. While early in the adoption process this often is a "hypothetical exercise" with little foundation in experience, the prospect of potential financial gains through process or product improvements will drive SMEs. An obstacle of the *assimilation* phase is the difficulty to gain an overview over the offer of the creative industries and to identify the "right designer" for the project. During *transformation*, design knowledge connected to the doing of things (iterative processes), some of it tacit such as the concept of product language or aesthetics, has to be absorbed. This phase can result in confusion, miscommunication between designers and company stakeholders and even distrust.

In the *exploitation* phase concepts such as, the orchestration of all touch points to create a coherent customer experience, need to be understood. At this point in time, it becomes obvious to SMEs that design is not a one-time activity but will have to become a company strategy to enfold its full potential. This might include more investment of financial as well as human resources. If exploitation of design knowledge is taken seriously, it is probable that the new design knowledge, overtime, will shape routines and that design management will become a dynamic capability.

While a sustained relationship with designers will support a more profound understanding of designerly ways of knowing and doing things, design management capability on the side of the SMEs will leverage design knowledge in a way appropriate to a company's specific context and challenges. The relationship between company and external design knowledge source becomes richer. This is, to some extent, in contrast to debates that have promoted design thinking as a silver bullet without a complementary design management function. The author of this paper posits that design management capabilities connect to prior company knowledge because they are managerial in nature. Since they are also close to design, design management capabilities are instrumental for SMEs to leverage design resources as a new complementary form of knowledge.

Conclusion

For SMEs with little or no design experience to gain competitive advantage through design, a process of acquisition, assimilation, transformation and exploitation of new design resources has to take place. This organisational learning and capability building process needs partly to be done in collaboration with external design partners and partly by the company itself through building up design management capabilities that fit its context and specific

necessities. Although there has been prior applied research to test the model, one limitation of this direction of research lies in the fact that design and design management capabilities are built over time. Longitudinal studies would be necessary to trace the success of design management absorption on the level of competitive advantage and even more so to see design management in action as a dynamic capability. Nevertheless, the DMAM can be used as *guidance* for the design support community, for practising designers who cooperate with companies, or for companies who want to monitor their own learning progress and enrich their resource base through new design knowledge.

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Design Management Absorption Model – A framework to describe and measure the absorption process of design knowledge by SMEs with little or no prior design experience

Abstract

The introduction of new design knowledge or design resources in companies with little or no design experience has been at the core of design support programmes in several countries. Scholars investigated the use of design and identified different design and design management capabilities to deploy design effectively in companies of all sizes. However, how design and design management capability is built in SMEs with little or no prior design experience is insufficiently investigated. Based on the absorptive capacity construct from the broader field of innovation studies, this paper proposes a comprehensive design management absorption model that includes design management capabilities enabling design absorption in SMEs with little or no prior design experience as well as indicators to measure the progress of absorption. The model allows for analysing and guiding the process companies go through when using design as a strategic resource for the first time.

Keywords: Design management in SMEs, absorptive capacity and design knowledge, design and design management absorption process and model

Introduction

Using design management as a strategic resource to differentiate products, manage design projects more effectively, or build brand value has been common since the 1965s (Farr 1965; Topalian 1979; Kotler and Rath 1984; Lorenz 1987). Since then, scholars have been intent upon defining and positioning design management as a management function in its own right. Design management has been described from different perspectives such as definitions and goals (Farr 1965; Gorb 1990; Blaich and Blaich 1993), organisational place and level (Cooper and Press 1995; Borja de Mozota 2003), people deploying design (Gorb 1990), their management and leadership responsibilities (Turner and Topalian 2002), or their tasks (Topalian 1979). Design management has been viewed as a process from the analysis of customer needs all the way to the launch of new products or services (Topalian 1979); it has also been conceptualised as a coordinator between functions, departments and an integrator of stakeholders (Bruce and Bessant 2002).

Other than marketing, which found its way into organisations in the 50s and 60s (Gorb 1990), design management failed to be widely adopted as a separate management function (Sun, Williams et al. 2011). Only lately, the debate on design thinking and the ensuing inclination of renowned companies such as P&G (Martin 2009) to include design knowledge into their value-creating and innovation processes has sensitised more organisations to design. Although the notion of design thinking is ambiguous and has provoked mixed reactions in the community of design practitioners as well as design scholars (Hassi and Laakso 2011) the "hype" has mostly been restricted to larger organisations.

Many small and medium-sized enterprises (SME) are still unaware of design as a strategic resource; some because they are technology-driven and are making "silent design" decisions (Gorb and Dumas 1987) or doing engineering design (Blaich and Blaich 1993); some because of barriers such as limited human and financial resources, less formal or non-existent product development and innovation processes (Fueglistaller 2004); some because of lack of access to design resources (Cox 2005) or poor design understanding (Moultrie, Clarkson et al. 2007) etc. From these few observations it can be concluded that starting to use design as a strategic resource involves a learning process on the side of SMEs on how to manage this new knowledge or strategic resource.

While, as stated before, much of the design management literature has focused on definitions, goals, responsibilities and tasks, little attention has been given to the question of how companies with little or no prior design experience build the capabilities to execute design management. Models such as the Danish Design Ladder (National Agency for Enterprise and Housing 2003) or

the Design Management Staircase (Kootstra 2009) implicitly address organisational learning proposing ascending levels of design and design management maturity but they fall short of outlining how exactly SMEs "mature" with respect to design management. A focus on capabilities and how they are built, however, needs to address the absorption of new knowledge and the configuration of resources.
To address this need, we introduce a model of *how* SMEs with little or no design experience acquire new design knowledge. Based on the *absorptive capacity construct* (Cohen and Levinthal 1990; Zahra and George 2002) from the broader field of innovation studies, we devised that conceptualises the absorption of design knowledge as an organisational learning process of *acquisition*, *assimilation*, *transformation* and *exploitation* including indicators to assess the success of the individual phases of the process. Design management and design leadership capabilities are viewed as organisational capabilities that have the potential – on one hand – to create competitive advantage, and – on the other hand – to change the company to a dynamic and flexible organisation. To understand "how design fits" and – as a result – to adequately deploy design resources to drive innovation and generate added value can even be considered as a *dynamic capability*, a concept that has been described in strategic management studies (Teece, Pisano et al. 1997; Helfat, Finkelstein et al. 2007).
In prior applied research (Acklin 2011) a prototype of a Design Management Absorption Model (DMAM) to *evaluate* the absorption processes and capability building of five Swiss SMEs was tested; thus the prototype was revised based on first empirical data, which added validation to an otherwise purely *prescriptive model*. Insights into weaknesses of the prototype and more literature review led to a second *more comprehensive* DMAM. This article, firstly, reviews the theory that led to both models; secondly, it discusses the experiences with the prototype of the model and the changes it went through. Finally, it presents the second model and concludes with a discussion of the improved model.

Literature and definitions

The key concepts to understand design management as an organisational capability yielding competitive advantage and strategic flexibility can be traced back to Edith Penrose's "The theory of the growth of the firm" (1959) and to ensuing concepts of strategic management such as the resource-based view (RBV) or the dynamic capability construct (DC).

Resources, capabilities and capacities

A company can be viewed as a bundle of productive *resources* with a management team deciding how to deploy them to make a profit (Penrose, 1959). These resources can be physical such as plants or equipment, but they can also be intangible such as the human resources available to the firm. However, "it is never resources themselves that are the 'inputs' in the production process, but only the services that the resources can render" (p. 22). Services are seen as an "activity" (p. 22) to put these resources at work. And: "As we shall see, it is largely in this distinction that we find the source of uniqueness of each individual firm" (Penrose, 1959, p. 22).
Some 40 years later these ideas were picked up by the resource-based view and by the dynamic capability construct (DC) explaining sustained competitive advantage. The resource-based view (RBV) defines resources as all assets, capabilities, organisational processes, firm attributes, information, knowledge etc. It's resources that are valuable, rare, imperfectly imitable and non substitutable that create a competitive advantage for a company (Barney 1991). On top of that the DC emphasises the notion that companies need "dynamic capabilities" to exploit existing internal and external firm-specific competences to address changing environments (Teece, Pisano et al. 1997). Companies should *dynamically* adjust to the changing business environment of a "Schumpeterian world" and strategic management should be capable to appropriately adapt, integrate, and reconfigure internal and external organisational skills, resources, and functional competences to match the requirements of a changing environment (Teece, Pisano et al. 1997).
Also design can be viewed as a bundle of resources in organisations. Based on Barney's (1991) definition of company resources, design can be regarded as a resource in several ways: Design is a

process and can be viewed as an organisational "routine" (Nelson, 1982)[1]; design is a specific form of *knowledge* (Jonas 2011); design can be an *asset*, e.g. in form of an in-house design team or a design alliance (Bruce and Jevnaker 1998); design resources can be conceptualised the as "powers" of design as a differentiator, integrator, transformer, and of design as "good business" (Borja de Mozota 2006); and design is a set of *design management capabilities* to enable the deployment of design resources (Gorb 1990) in a way to harvest the benefits "these services can render" (Penrose, 1959).

In past research, design management scholars (Kotler and Rath 1984; Dumas and Whitfield 1990; Bruce, Cooper et al. 1999; Perks, Cooper et al. 2005; Borja de Mozota 2006; Chiva and Alegre 2007; Chiva and Alegre 2009) identified different *design and design management capabilities* in organisations: Some extract specific design capabilities from product development processes (Perks, Cooper & Jones, 2005) or from the design management use of design-oriented companies (Borja de Mozota, 2006), or detect a connection between an in-house design team and the design management skills of companies (Chiva and Alegre 2007). These scholars mostly describe a specific design management function or person and his/her tasks and abilities.

The shift to viewing design management as an organisational capability is a relatively new one. Jevnaker (1998) lists the following component capabilities in organising design and its management: 1. Resourcing capability, the ability to acquire and manage profitable design resources. 2. Combinative capability, the ability to configure design resources. 3. Organisational learning capability, which is an absorption capability. 4. Innovation capability. 5. Design-strategic capability, capability to integrate design into business strategy. 6. Protecting capability of design-based advantages (p. 21).

As can be seen from this short summary, in design management theory the terms task, skills or capabilities are used ambiguously and depending on the context of use. Here, we root these terms in the DC construct – meaning design management capabilities are the capacity of deploying design resources in an adequate (and dynamic) way. From strategic management studies Amit and Schoenmaker (1993) clarify the distinction between *resources* and *capabilities*: Capabilities are the capacity to deploy them. Like resources these capabilities are firm specific and are developed over a longer period of time through learning processes. They are information-based, tangible and intangible processes and they "can abstractly be thought of as 'intermediary goods' generated by the firm to provide productivity of its resources, as well as strategic flexibility and protection for its final product or service" (p. 35).

A *capacity* is the ability to perform a certain task in a minimally acceptable manner (Helfat, Finkelstein et al. 2007). To qualify as a capability the capacity to execute a specific task needs to have a *patterned element*, a company needs to be able to repeatedly perform a certain task in a minimally acceptable manner.

Absorptive capacity and design complementarity

In the ACAP construct organisational learning and capability building are a result of new knowledge absorption and critical to innovation or to the development of new offerings. According to Cohen and Levinthal (1990) absorptive capacity (ACAP) is "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (p. 128). Although the ACAP construct, in its beginning, has been focusing on the acquisition of technological and scientific knowledge through the R&D function of a firm, Cohen and Levinthal (1990) also name other business units such as manufacturing, design or marketing as the beneficiaries.

Referring to the resource-based view (Barney 1991) and to the dynamic capability concept (Teece, Pisano et al. 1997; Helfat, Finkelstein et al. 2007), Zahra and George (2002) re-conceptualise ACAP as a set of organisational routines and processes, and connect it to the dynamic capability concept by viewing ACAP as a dynamic capability that impacts on the resource base of a company to provide it with multiple sources of competitive advantage. They suggest that there are four organisational capabilities: knowledge acquisition, assimilation, transformation, and exploitation.

Drawing on insights from cognitive behavioural science, Cohen and Levinthal (1989, 1990) state that prior knowledge helps to value new information and to assimilate it. In spite of an already existing memory (of knowledge) new knowledge might be acquired, but often not utilized well because individuals do not possess the appropriate knowledge to put the new knowledge into context. Zahra and George (2002) distinguishing potential capacity (PACAP), the ability to acquire and assimilate knowledge, from realized capacity (RACAP), the ability to transform and exploit new knowledge. While PACAP makes a company susceptible to learning, RACAP enables the company to leverage PACAP.

It's a common experience of design practitioners and of past and on-going applied research of the author of this article (Acklin and Hugentobler 2008; Acklin 2010; Acklin 2011) that SMEs will reject the idea of integrating design into their new product development projects or often abandon it early on. This is explained by time or money constraints by SMEs but often points to a deeper chasm between engineering and design or management and design values and their ways of "handling things".

Here are some of the explanations for the difficulty to acquire and manage new design knowledge by large as well as by small firms: 1) Design knowledge has rarely been part of management education and, thus, is an alien resource to many managers (Jevnaker 1998; Boland Jr. and Collopy 2004; Martin 2009) as well as to engineers (Jahnke 2009). 2) Design is an "experience good" (Commission of the European Communities 2009). Confidence in design as a resource grows, once there have been positive experiences with and observable effects of the use of design (Perks, Cooper et al. 2005). 3) A "design attitude" (Boland & Collopy, 2004) has some irritating "ingredients" for management teams such as an insistence on fluid and iterative processes of searching, experimenting and prototyping, zooming in and out of the problem while maintaining a holistic view (Conley 2004), accepting high levels of uncertainty (Jevnaker 1998), while evaluating multiple alternatives (Conley, 2004), and being led by a human-centred design ethos stressing empathy with user needs as a starting point for innovation (Brown 2008). 4) Also the tacit dimension of design knowledge that is embodied in products as well as in people has been mentioned (Jevnaker 1998).

An empirical study with French companies from the clothing and the construction business researched the difference of design knowledge from engineering or marketing knowledge during the absorption process in new product development and came up with an enlightening list of typical attributes (Abecassis-Moedas and Mahmoud-Jouini 2008): 1. Companies perceived design as related to an individual designer/architect rather than embedded to a collective as in their firms. 2. Design relies strongly on tacit rather than explicit knowledge, the latter being more present in, e.g. manufacturer or retailer's knowledge. 3. Designers are inclined to use divergent thinking rather than convergent. Designers rather strive on creative exploration, while e.g. engineers work on well-specified problems. 4. Designers keep to a peer-orientation giving more importance to their peer's opinions than to the one's commissioning the project.

While the gap between design and engineering or management and the difficulty to relate design knowledge to prior organisational knowledge can be a problem, the complementarity between manufacturing and design or retail and design knowledge can be a critical aspect for the successful absorption process. Abecassis-Moedas and Mahmoud-Jouini (2008) come to the conclusion that – if the source knowledge as represented "through the archetypical figure of the architect or the fashion designer" (p. 474) is at the same time related and diverse and if it is combined effectively with the recipient's knowledge (firm) – positive effects can be observed on NPD performance such as process efficiency (cost) and product effectiveness (quality).

Prototype of the model

In the prototype of the Design Management Absorption Model (see Figure 1), the four organisational capabilities of acquiring, assimilating, transforming and exploiting with respect to design management knowledge are listed. The acquisition phase consists of recognising the potential of design as a resource and identifying specific design contributions to a company's bottom line. Once this has been done, specific design resources will have to be assimilated, transformed and exploited.

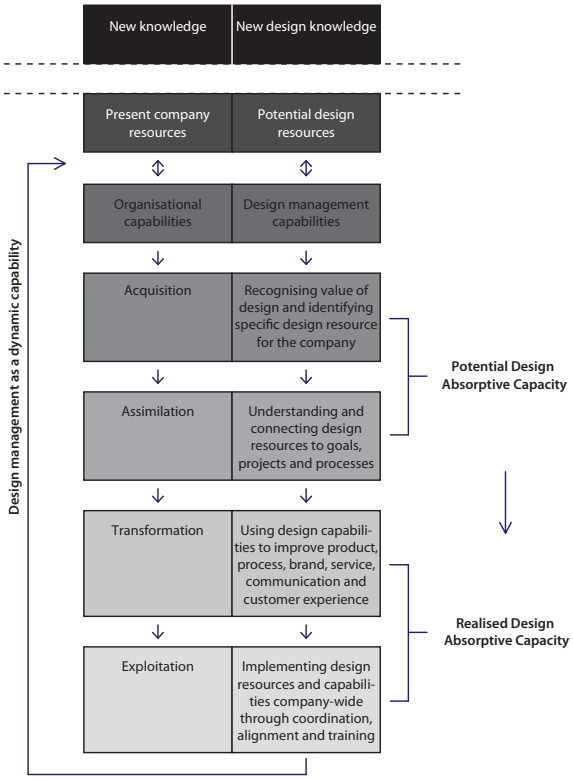

Figure 1: Prototype Design Management Absorption Model (Acklin 2011 based on Zahra and George, 2002)

Assimilation entails a deeper understanding of the new design knowledge by connecting it to company goals, projects and processes. During the transformation phase, the new design knowledge has to be deployed effectively through building design management capabilities and using design tools to improve all customer touch points such as products, brands, services, communication, or processes such as NPD or innovation processes. The exploitation will involve the company-wide implementation of the design resources through integrating design into processes, coordinating functions, aligning core values, training the staff etc.

In our prototype model we suggested the same distinction between Potential Design Absorption Capacity and Realised Design Absorption Capacity as Zahra and George (2002); much like them we stated that the development of potential design management capabilities does not guarantee the successful transformation and exploitation of these capabilities. Potential resources will need to be changed into specific design management capabilities that include a "patterned element" (Helfat et al. 2007), a capacity to repeat certain actions.

Once design as a potential resource has been recognised, assimilated, transformed business routines and has been exploited successfully, design and design management capabilities can impact on existing company resources. Ultimately, design management can act as a dynamic capability, changing the company on a deeper level and improve its overall competitiveness and strategic flexibility.

Data and methods

In 2009/2010 an action research project was conducted followed by an evaluation of results and company lessons (Acklin 2011). At the outset of that project, it was not intend to develop and validate a DMAM. However the prototype, which was developed during literature review for a later project, lent itself for a trial. The model was not introduced to companies during evaluation but used by researchers only to analyse company results from a knowledge absorption perspective. To understand results concerning the model, nevertheless, a sketchy outline of the data is provided in Table 1.

Table 1: Company overview including company information, project goals and result

	Company 1 Service company	**Company 2** Manufacturer B2B	**Company 3** Healthcare	**Company 4** Manufacturer B2B	**Company 5** Manufacturer B2B
Company information	Specialised in consulting and knowledge exchange services between for SMEs	Specialised in printing textiles for B2B market	Privately owned clinic	Start-up company developing a new pellet machine processing biomass and offering services connected to it	Specialised in contract manufacture of textile products
Project goal during action research project	Optimisation of touch points and improvement of customer experience	Optimisation of innovation process and organisation; exploration of new business opportuni-ties (e.g. develop-ment of a B2C product)	Optimisation of way-finding system to and inside clinic (entrance hall)	Introduction of industrial design in NPD process, development of services and business model connected to new product	Development of corporate identity, corporate design, brand values and brand name

The sample of companies (Table 1) was not representative of any trade or sector; only the following selection criteria were applied: The company had to be a SMEs and it had to be willing to explore design and design management as a driver of innovation. The company projects followed the cycle of action research of as described by Susman and Evered (1978) of *diagnosing, action planning*, *action taking*, *evaluating* and *specify learning*: At the beginning, researchers and companies *diagnosed* the strengths and weaknesses of the present use of design (as evident in products, services, communication, brand and overall customer experience) and current threats and opportunities from the business environment. Based on the initial analysis, design strategies and (innovative) design projects for each company were identified (*action planning*). In addition, the sourcing and briefing of and the communication with external designers were facilitated where design work was needed (*action taking*). During a period of seven to seventeen months, depending on the needs of the individual company, researchers worked as "facilitators who catalysed the process within the subject company" (Platts 1993) introducing several design and design management approaches and tools such as customer journeys, experiential research methods to enable learning processes with respect to design management concepts.

Six to nine months after these workshops, an evaluation was conducted to understand whether or not the companies had carried out their projects, and what the "tangible" results were (*evaluating*). Semi-structured interviews also aimed at finding out how they made use of design and design management since the action research phase, whether their perception of design had changed, and how the specific design projects had been implemented (*specify learning*). In retrospect, the progression of absorption through the stages of acquisition, assimilation, transformation and exploitation, and the success of the absorption process in regard to the impact on the overall resource base of the company were rated (see Table 2, Appendix) using the prototype of the DMAM and a scoring system going from 0 to 100 % knowledge absorption.

Results from applied research project

Company 4 succeeded in realising ACAP, Companies 1 and 3 were on the way of doing so and Companies 2 and 5 failed. Company 4 succeeded completely in absorbing and integrating new design knowledge. At the beginning, the CEO doubted that design would proof relevant in his

field at all. However, in cooperation with the industrial designer, the company simultaneously managed to cut production costs, to install a modular architecture, and to improve ergonomics and product semantics of their product. Furthermore, by exploiting design and design management Company 4 moved from a mechanical engineering company, who have been constructing and selling machinery to a system provider, which now offers innovative services based on a well-designed machinery as a core. These changes of the resource base indicate that design management has acted as a dynamic capability. The CEO also pointed out that the technological know-how the company possesses has been made more visible and tangible to customers and stakeholders with the help of design. One year later, with a new project the company continued its cooperation with the designer.

Also Company 1 was able to absorb new design management knowledge in a way that it impacted on the overall resource base of the company; a new customer experience strategy became part of the overall strategy of the company. The use of tools such as the customer journey and the brand persona resulted not only in a re-design of most communication media such as the logo, business documents and website, the company also reworked and refocused single services, all of the service portfolio and their overall customer experience strategy. As a result the number of unsolicited enquiries from customers increased. The company still uses some of the design tools to check whether it keeps to its customer experience strategy. However, it was not completely clear as to whether the company would be using these tools in the future.

Company 3 made some progress on its absorption of new user-centred design knowledge. However, changes in the responsibility for the design project and internal pressure from the head office slowed down the absorption process nearly bringing it to a stop. While customer-orientation was part of the culture of the clinic before, certain design tools such as the use of an ageing suit by some members of the board made a strong impression on the perception of human-centred approaches. The clinic was planning to use this method again.

In Companies 2 and 5 the researchers observed no design absorption process in the company. In the case of Company 5 this was due to external obstacles. To increase visibility and market power the manufacturer aimed to become independent from a governmental department. During the action research period, a corporate identity and branding project, a strategy to open up new market segments, and eventually to offer new proprietary products was developed. The manufacturer handed in the business plan to the local authorities and had to wait for its decision. At the end of the applied research project, we had little evidence that ACAP would be realised. In the case of Company 2, instead of developing new business opportunities and eventually a new product, questions on how the succession of one of the CEOs should be handled took centre stage. One team member displayed interest in the design and design management tools, but she was not able to implement them because of her position in the company. In this case, potential capacity was given, but a lack of power to transform and exploit the new knowledge inhibited the realisation of the capacity.

Discussion prototype of model

To evaluate company results with the first DMAM proved to be successful: To distinguish one company from the other in regard to design knowledge absorption was possible as well as broadly mapping absorption progression of the individual companies. In the case of Company 4 evidence of design management absorption acting as a dynamic capability could also be found. However, the measurement of the progression of design management absorption was too basic and sometimes arbitrary. What would justify the increase of the score by 25% had not been defined. The prototype also had a self-contained quality not including triggers leading to knowledge absorption or outcomes, or people acting within absorption processes. In addition, the self-assessment through companies would have been a corrective to the possibly limited view of the researchers. For the model to be of use as an *evaluation framework* as well as a *roadmap* during the process of organisational learning, the DMAM needed to be more comprehensive, including indicators for successful knowledge absorption, a more refined definition of design management and design leadership capabilities, and a more dynamic view of the learning process, its triggers and outcomes.

Revised model

To improve the model – besides the insights mentioned above – a more in-depth study of literature was conducted. The new version now offers five different dimensions to support the "navigation" of the absorption process as well as its analysis. Just like the first version, the revised Design Management Absorption Model (DMAM) conceptualises design management as an organisational capability that facilitates the absorption of new design resources and leverages design knowledge to achieve competitive advantage. The absorption process and design management capability building can be supported by the use of *design approaches* and *tools* as well as by the (sustained) collaboration with external designers. If the absorption of design management and design management capabilities move from potential to realised absorptive capacity through socialisation and diffusion of design knowledge inside the company, design management can yield external outcomes as well as internal effects such as strategic flexibility and, ultimately, act as a dynamic capability (see Figure 2).

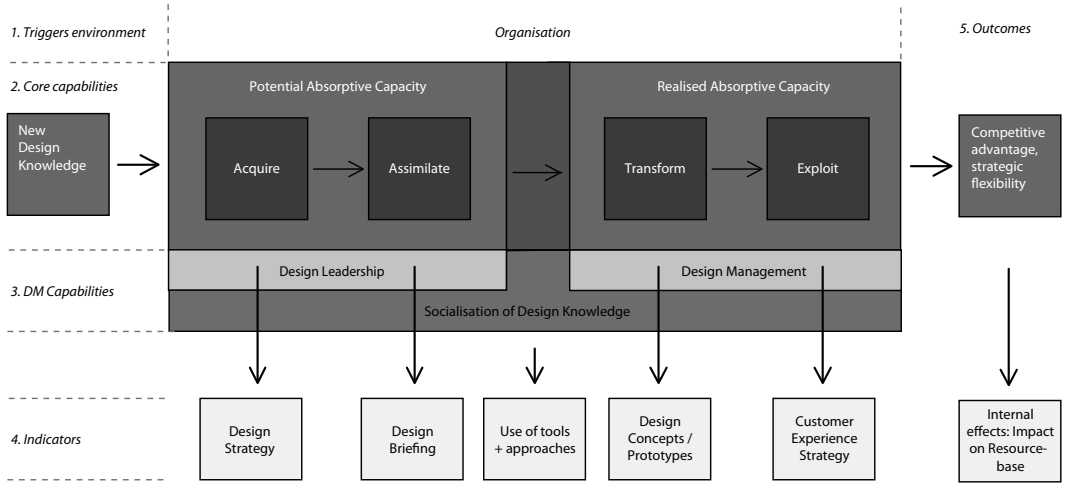

Figure 2: Second Design Management Absorption Model (based on Zahra & George, 2002)

Triggers

One of the central questions is how new design knowledge finds its way into the company. According to Zahra and George (2002), internal or external triggers such as an organisational crisis, performance failure, technological shifts, or radical innovations that occur outside the company activate the absorption of new knowledge. In addition, the firm's motivation or willingness to absorb new knowledge is key (Abecassis-Moedas and Mahmoud-Jouini 2008).

Core capabilities of design knowledge absorption

Following Zahra and George (2002), design management absorption is divided into the four organisational capabilities of *acquiring*, *assimilating* (PACAP), and *transforming* and *exploiting* (RACAP) new design knowledge. *Acquisition* consists of identifying a specific design contribution to the company's bottom line. *Assimilation* entails a deeper commitment to the new design knowledge by combining it to engineering or marketing processes and projects and by establishing to work with either complementary sources of design knowledge. During

transformation, the new design knowledge has to be deployed effectively to improve offerings such as products, brands, services, communication, or efficiently to manufacturing or innovation processes. *Exploitation*, involves the company-wide implementation of design resources through integrating them into relevant processes, coordinating functions, aligning core values, training staff etc. and through delivering a coherent customer experience at all touch points. Since absorption processes mainly take place during concrete work assignments and projects, the DMAM follows a prototypical development process.

Design Leadership and Design Management Capabilities

In this article a distinction between strategic or leadership and operational design management capabilities is made (Topalian 1979; Cooper and Press 1995; Turner and Topalian 2002; Borja de Mozota 2003). This distinction allows for connecting the DMAM to SMEs, which are strongly controlled by the owner/founder of the company (Mintzberg 1979; Fueglistaller 2004). He or she is the "gatekeeper" as described by Cohen and Levinthal (1990) and determines whether design knowledge classifies as useful or not. In the model, acquisition and assimilation are related to design leadership capabilities and transformation and exploitation to design management capabilities, although the notions blur into each other (Turner and Topalian 2002); this also because owners of SMEs are involved in strategic as well as in operational work (Fueglistaller 2004). The DMAM refers to design management capabilities as described by different authors (Topalian 1979; Jevnaker 1998; Perks, Cooper et al. 2005) putting them into an order suitable for the absorption process and complementing or omitting elements to match the situation of SMEs (Table 3).

Table 3: Design leadership and management capabilities connected to design management absorption

Acquire	Assimilate	Transform	Exploit
Design Leadership capabilities		Design management capabilities	
Defining hypothesis for new business opportunity; formulating a design strategy as part of company strategy (Jevnaker, 1998)	Sourcing design expertise and combining it with in-house team expertise (Jevnaker, 1998); briefing of external partner (Perks, Cooper, & Jones, 2005); contracting and allocating resources	Facilitating project development (Topalian, 1979); managing different stakeholders out- and inside company	Aligning corporate values and project outcome; coordinating functions, processes etc. to achieve coherent customer experience

Socialisation of design knowledge

Design knowledge entails design processes, approaches such as human-centeredness, visualisation, experimentation, prototyping, etc., and tools as well as an attitude towards creation of innovative solutions. While the cooperation with external designers will trigger a learning process, SMEs can absorb design knowledge themselves. Jonas (2010) re-conceptualises the notion of design in the following way: "Design is a *process,* which uses *knowledge* to generate new *forms* and new *(forms of) knowledge"* (p. 1). Design knowledge contains tacit dimensions (Rust 2004) using tools such as future customer personas, user scenarios, or customer journeys to convert tacit into explicit knowledge (Nonaka 1994). Since SMEs are close to their customers they have a wealth of tacit knowledge to inform designer's solutions once it is made explicit. In addition, the use of these tools by company members is a vehicle to introduce how designers work, to socialise design knowledge throughout the company.[2]

Indicators

Indicators are evident outcomes to support the description and measurement of the progression of the design management absorption process. The first indicator is an often-sketchy (nevertheless explicit) *design strategy* or *hypothesis* of where a process and the absorption of design knowledge connected to it should take the enterprise. It triggers search and knowledge creation activities to understand the envisioned business opportunity. A *design briefing*, the second indicator, constitutes the assembled knowledge at this point in time, the direction and the scope of the design work. The briefing can be in a written or oral form and represents the condensation of strategic intent communicated to and re-worked by designers. Indicators of a successful collaboration with a complementary design knowledge source are *concepts* and *prototypes* of a future product or service. Finally, an indicator for a holistic understanding of design management as a multi-layered activity to achieve touch point orchestration is a *customer experience strategy* that might initiate a long-term transformation and exploitation of design knowledge throughout the company.

Outcomes

Zahra and George (2002) described ACAP "as a dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage" (p. 185). The same can result from absorbing design and design management knowledge if design resources are connected to value creating process of SMEs. Consequently, an external outcome of absorbing new design knowledge can be a competitive advantage achieved through improved offerings and customer experiences. There can be an internal outcome as well, which might be even more important because it has the potential to change a firm into a dynamic and flexible entity. Although scholars mention that measuring dynamic capability is difficult (Helfat, Finkelstein et al. 2007; Ambrosini and Bowman 2009), the DMAM proposes that an indicator for design management as a dynamic capability is a change of the resource-base of a company such as altered innovation processes or company structures that include designers or design managers. There also needs to be a "patterned element" (Helfat, Finkelstein et al. 2007) in the way a company handles strategic as well as operational routines.

Discussion second model

Overall, little design management research about the use of design in SMEs with little or no design experience exists. Research agendas developed around design policies and design programmes supporting the case for more governmental initiatives in view of the large number of SMEs in Europe[3]. While maturity models (National Agency for Enterprise and Housing 2003; Kootstra 2009) take a snapshot at the status quo, the DMAM outlines how SMEs absorb design knowledge, how they actually mature, and, finally, how they grow in the sense of Penrose (1959). By intertwining the ACAP and the DC constructs with various dimensions of design management into one comprehensive model, the DMAM also succeeds to conceptualise design management as a dynamic capability to gain and sustain competitive advantage.
Chiva and Alegre (2007) found that companies from the Italian and Spanish ceramic tile industry are more able to harness design management skills if there exists an in-house design team. Not all SMEs will have the human and financial resources to create a design department but also a sustained relationship with external designers will support a more profound understanding of designerly ways of knowing and doing things. Once basic design management capabilities have been built on the side of the SME, these will leverage design knowledge in a way appropriate to the company's specific context and challenges. In addition, the relationship between company and external design knowledge source becomes richer.

This is, to some extent, in contrast to debates that have promoted design thinking as a silver bullet without a complementary design management function. We conclude that design management capabilities are more readily absorbed than design capabilities because they connect to prior company knowledge and are managerial in nature. Design management capabilities

bridge the gap between PACAP and RACAP, and, overtime, can shape resources and become a dynamic capability.

Conclusion

How companies absorb new knowledge is a complex phenomenon, since individuals as well as teams, internal as well as external stakeholders, etc. interact in companies during absorption processes. In the area of organisational learning, there exist two streams of literature (Tsang 1997); one that is based on theory, that is *prescriptive* and aims at answering the question of how companies should be learning; and one that is *descriptive* that is based on empirical research and focuses on how companies actually are learning. Since both approaches have their merits and limitations, Tsang (1997) opts for an integration of both ways of formulating models. This was done here as well: The test of the prototype of the DMAM, a prescriptive model emerging from a literature review, informed the second model through empirical data. The second model will be validated in a follow-up project, which again will enrich the prescriptive by new empirical results. Nevertheless, certain limitations remain: Design management capabilities are built over time and longitudinal studies would be necessary to trace the success of design management absorption on the level of competitive advantage and even more so to see design management act as a dynamic capability. Keeping these limitations in mind, the DMAM is useful to *evaluate* and *compare* companies' absorption processes in a differentiated qualitative manner. It could also be used to *guide* cooperation between design consultants or practising designers and SMEs with little or no design experience. The main contribution of the DMAM – apart from the fact that the ACAP construct has been made accessible to the design management practice – is that it makes distinct steps of design management knowledge absorption traceable and controllable through indicators that act as "check points" during the process.

Footnotes

[1] In evolutionary theory, Nelson and Winter (1982) came up with the term "routines" comparing routines to the role genes play in biological evolutionary theory.

[2] See also the notion of "design infusion" as describe by (Dumas and Mintzberg 1989).

[3] E.g. See Design, http://www.seedesign.org (accessed Aug. 2012)

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Appendix

Table 1: Evaluation of interviews with SMEs about absorption process and design management capability building

	Company 1 Service company	**Company 2** Manufacturer B2B (textile print)	**Company 3** Healthcare	**Company 4** Manufacturer B2B (engineering)	**Company 5** Manufacturer B2B (textile industry)
Acquisition	Recognition of value of design (some questions on nature of design mgmt.)	Recognition of nature of innovation process; design as a driver of new business opportunity	Recognition of human-centred design models for designing relationship with customers/patients	Recognition of value of design in all company areas	Recognition of design as something more complex than assumed
Progression bar*					
Assimilation	Understanding design and design mgmt. Contributions to company goals (customer experience) results in design project development	Understanding problems with then current innovation process, innovation organisation and attributed human resources	Understanding of problems with way-finding system and understanding contribution of design results in design project	Understanding of contribu-tion of industrial design to form giving, ergonomics and cost reduction of new machine; of system's and information design to business model generation and communication	Understanding of contribution of design to corporate identity building results in naming and corporate identity project
Progression bar*					
Transformation	Cooperation with external designer; use of design tools for analysis and synthesis for design project through company	Employment of design manager (successor to leaving CEO)	Formulation brief for concept development to optimise way-finding system, sourcing designer; revision of customer entry forms.	Formulation brief for design of engineering prototype, sourcing designer; use of design tools such as visualisation, customer journey etc.	None (external obstacle to progression of project)
Progression bar*					
Exploitation	Use of design tools (e.g. customer journey as blueprint for sustained adaption of services; brand persona to outline prospective CI)	None (internal obstacles due to change in leadership and human resources)	Partial adoption of user-centred perspective for management decisions; synergy between human-centred design view and change in cultural values and leadership	Following product was developed with industrial designer right from the start; use of visualisation for internal communication	none
Progression bar*					
Impact on company resources	Inclusion of customer experience strategy in overall business strategy	None	Reinforcement of human-centred view	New organisational structure (with design); adaptation of corporate design	none
Progression bar*					

* Incremental progression by 20 % increasing from left to right

EAD Conference in April 2013

Title

Challenges of introducing new design and design management knowledge into the innovation activities of SMEs with little or no prior design experience

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Abstract

Design management, for many years, has been proclaiming the benefits of using design as a strategic resource and trying to introduce it to companies through sourcing design skills, putting them to work in specific (innovation) projects, and managing and controlling design processes. However, many organisations, namely small and medium-sized companies, do not have any intermediary such as a design manager to take care of design activities; they will have to find other ways of integrating new design knowledge with its value creating and innovative powers, once they get aware of the benefits of design. To understand how companies "learn" new knowledge the absorptive capacity construct from innovation studies puts forth that the new knowledge source needs to connect to prior knowledge of the company as well as to be complementary to it. So there is a fine line between being too similar to prior knowledge and too divergent to be perceived as complementary. There is a lot of anecdotal evidence that this paradox is the cause of many of the challenges designers face when working with companies with little or no prior design experience. Based on applied research with eight SMEs in Switzerland, this paper describes these challenges in more detail using a Design Management Absorption Model that allows for a more systematic analysis of design management absorption. This paper argues that companies with little or no prior design knowledge are more able to cope with designers and the challenges of absorbing new design knowledge if they themselves build up design management capabilities.

Introduction

So far, design has been surprisingly absent from innovation studies because of a poor conceptualisation of design as a creative economic activity in companies (Hobday, Boddington, & Grantham, 2011). Furthermore, in innovation studies many disciplines such as management studies, economics, entrepreneurship, psychology or sociology converge into one broader notion of innovation with many concepts overlapping and little dialogue amongst them (Cruickshank, 2010). Nevertheless, lately scholars as well practitioners put design as a driver of innovation on the agenda (Kelly & Littmann, 2004; Utterback et al., 2006; von Stamm, 2008; Verganti; 2009); policy makers did as well (Commission of European Communities, 2009), and also companies' interest has been triggered by design thinking literature providing tools and processes to quickly apply design approaches to their innovation activities (Brown, 2008, 2009; Martin, 2009, Liedtka & Ogilvie, 2011).

Before, for many years, design management has been the intermediary between design as a strategic resource or as a driver of innovation and other business functions such as marketing or engineering; some of the main tasks of design management was to familiarise companies with design's potentials and skills (Borja de Mozota, 2003), putting them to work in specific company projects (Farr, 1965; Topalian, 1979), managing and controlling design processes as part of new product development or innovation (Cooper & Press, 1995; Von Stamm, 2008), etc. While in the mid-60s firms were afraid of "being fleeced by a horde of

idle artists" (Farr, 1965), today many big companies have an established design management function to take care of operational as well as strategic design tasks.

However, many organisations, namely small and medium-sized companies (SMEs), have a poor understanding of design (Moultrie, Clarkson, & Probert, 2007) or even stereotypes similar to the one just mentioned above (Cox, 2005); they have little appetite for risk and limited resources (Fueglistaller, 2004); most of the time they do not have a design manager to take care of design and innovation activities. While there is research about design and design management in SMEs (Berends et al., 2010; Bruce, Cooper, & Vazquez, 1999; Chiva & Alegre, 2007), little is known about the question, how new design and design management knowledge "enters" SMEs with little or no design experience, and how they adopt this knowledge to improve their offerings or to increase innovation capability.

To understand how companies "learn design" the absorptive capacity construct (Cohen & Levinthal, 1990; Zahra & George, 2002) puts forth that the new knowledge source needs to connect to prior knowledge of the company as well as to be complementary to it. However, there is a fine line between being too similar to prior knowledge and being too different to be perceived as complementary. Moreover, there is a lot of anecdotal as well as academic evidence (Acklin & Hugentobler, 2008) that this paradox is the cause of many challenges when designers and companies with little or no prior design experience collaborate.

Based on action research[1] with eight SMEs, this paper describes these challenges in more detail using a Design Management Absorption Model (DMAM) that allows for a systematic analysis of the process of design and design management absorption. The DMAM is based on the absorptive capacity construct (Cohen & Levinthal, 1990; Zahra & George, 2002) and integrates several disciplines from innovation, strategic management and design management studies. It thus offers a multidisciplinary view on a complex phenomenon such as organisational learning as well as embeds design and design management as distinct activities emphasising the specific contribution design and design management can make to absorption and – ultimately – to innovation processes.

From previous research (Acklin, 2011) we conclude that SMEs with little or no prior design knowledge are more able to cope with designers and the challenges of absorbing new design knowledge if they themselves build up the design management capabilities to successfully integrate the new knowledge source that might diverge from their usual way of looking at their business. To further substantiate this insight is one of the intentions of this paper.

The paper, first, reviews literature connected to the absorptive capacity construct (ACAP) and design studies' overlap with it. It then introduces a critical framework, the Design Management Absorption Model used to analyse the progression of design management absorption in the eight SMEs under study. The results chapter summarises *themes* regarding issues and challenges of design management absorption that emerged from the cross-case comparison of individual company case studies. The next chapter discusses the results and, finally, the contributions to theory, limitations and further research are shortly outlined.

Literature and definitions

The ability to absorb external knowledge is critical for a company to innovate. While learning-by-doing refines the existing practice, the acquisition of outside knowledge allows for doing things differently

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1 Since absorption is an active learning process and in the learning was depending on an external knowledge source introducing new knowledge, action research was chosen as a research methodology to observe change in the making.

(Cohen & Levinthal, 1989). In 1990, Cohen and Levinthal coined the term absorptive capacity (ACAP), "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends (p. 128)". Although the APAC construct revolves mainly around the acquisition of technological and scientific knowledge through the R&D activities of a firm, also other business units such as manufacturing, design or marketing are named as beneficiaries (Cohen & Levinthal, 1990).

Based on insights from cognitive behavioural science Cohen and Levinthal (1990) state that the prior possession of relevant knowledge and skills is what gives rise to creativity, "permitting the sorts of associations and linkages that may have never been considered before" (p. 130). Thus problem solving and learning capabilities are similar. While learning capabilities involve the development of the capacity to assimilate existing knowledge, problem-solving skills represent the capacity to create new knowledge. Knowledge diversity facilitates innovative processes by enabling individuals to make novel associations and linkages (Cohen & Levinthal, 1990).

Utterback et al. (2006) posit that design-driven innovation "requires a creativity of a higher order" (p. 1) to achieve the synthesis of all the many variables of innovation projects. They list at least three essential components in need of integration: technology, user needs and language. Design-driven innovation can be seen as an amplifier of product and service qualities that evolve into *systems* of products, services and experiences and are loaded with meanings (as transferred by product language).

To learn to use of design's "higher order creativity" is not the achievement of any single individual but depends on the links across individual capabilities. New knowledge must actively be exploited by the organisation, after having been introduced by *a gatekeeper* that stands at the interface of both the firm and the environment, and between the subunits of the firm. A similar notion as the gatekeeper exists in design management studies (Dumas & Mintzberg, 1989; Borja de Mozota, 2003). The so-called design champions propagate design internally and familiarise senior management or other company members with it. While these design champions might already be a source of new design and design management knowledge, the gatekeepers of SMEs with little or no prior design experience are not yet familiar with it, which makes the early stages of design management absorption precarious ones.

Zahra and George (2002) proposed a re-conceptualisation of ACAP and divided it into two subsets: potential (PACAP) and realized absorptive capacity (RACAP). Potential capacity consists of the ability to acquire and assimilate knowledge, realised capacity enables to transform and exploit new knowledge. PACAP makes a company susceptible to learning; RACAP enables the company to leverage PACAP. The authors propose a conceptual model that captures antecedents of ACAP, ACAP itself as well as the outcomes of ACAP.

It's a common experience of design practitioners and of past and on-going applied research of the author of this paper (Acklin, 2011; Acklin, 2009) that SMEs will often reject or abandon the idea of integrating design into their innovation and new product development projects early on. This can be explained by time or money constraints but also points to a deeper chasm between engineering and design or management and design values and their ways of handling things (Jahnke, 2009).

This points to the question, whether design knowledge is more difficult to absorb than other forms of knowledge. An empirical study with French companies from the clothing and the construction business investigated the difference of design knowledge from engineering or marketing knowledge during the absorption process in new product development and came up with an enlightening list of typical attributes

(Abecassis-Moedas & Mahmoud-Jouini, 2008): 1. Companies perceived design as related to an individual designer/architect rather than embedded to a collective as in their firms. 2. Design relies strongly on tacit rather than explicit knowledge. 3. Designers are inclined to use divergent thinking rather than convergent and rather strive on creative exploration, while e.g. engineers work on well-specified problems. 4. Designers keep to a peer-orientation giving more importance to their peer's opinions than to the one's commissioning the project.

While the gap between design and engineering or management and the difficulty to relate design knowledge to prior organisational knowledge can be a problem, the complementarities between manufacturing and design or retail and design knowledge can be a critical aspect for the successful absorption process (Abecassis-Moedas & Mahmoud-Jouini, 2008). Contrary to Cohen and Levinthal (1990) who stressed the importance of prior knowledge in the absorption of new knowledge, Zahra and George (2002) propose as well that knowledge needs to be related and at the same time different from prior knowledge. Antecedents of ACAP are knowledge absorption from external sources building on experience and knowledge complementary.

Later in the process of absorption, new knowledge must actively be socialised and exploited by the organisation (Zahra & George, 2002). Referring to Barney's (1991) concept of the resource-based view (RBV) and to the dynamic capability concept (DC) of Teece et al. (1997), Zahra & George (2002) connect the ACAP construct to the dynamic capability concept by viewing ACAP as a DC that impacts on the resource base of a company providing multiple sources of competitive advantage. If we follow this line of argumentation then also design management capabilities could become a dynamic capability able to provide competitive advantage through improved or new offerings as well as strategic flexibility.

Critical framework

Based on Cohen & Levinthal (1990) and Zahra & George (2002) and on concepts about design management capabilities (Topalian, 1979; Cooper & Press, 1995; Jevnaker, 1998; Topalian & Turner, 2002; Perks et al., 2005), design management can be conceptualised as an organisational capability that facilitates the absorption of new design resources and leverages design knowledge to achieve competitive advantage. The absorption process follows the stages of acquisition, assimilation, transformation, and exploitation. Socialisation mediates between PACAP and RACAP and can be supported by the use of design approaches and tools as well as by (sustained) collaboration with external designers and design facilitators.

Here we introduce a narrative version of the DMAM[2], since this visual form of the model was used during evaluation of the action research project (see Figure 1). The components of the DMAM are: 1) core capabilities of design knowledge absorption and activities during ACAP; 2) actors of ACAP; 4) trajectories of new design management knowledge; 3) indicators of ACAP.

[2] The theoretical foundations of the Design Management Absorption Model have already been presented in another paper; for details please refer to (reference left out).

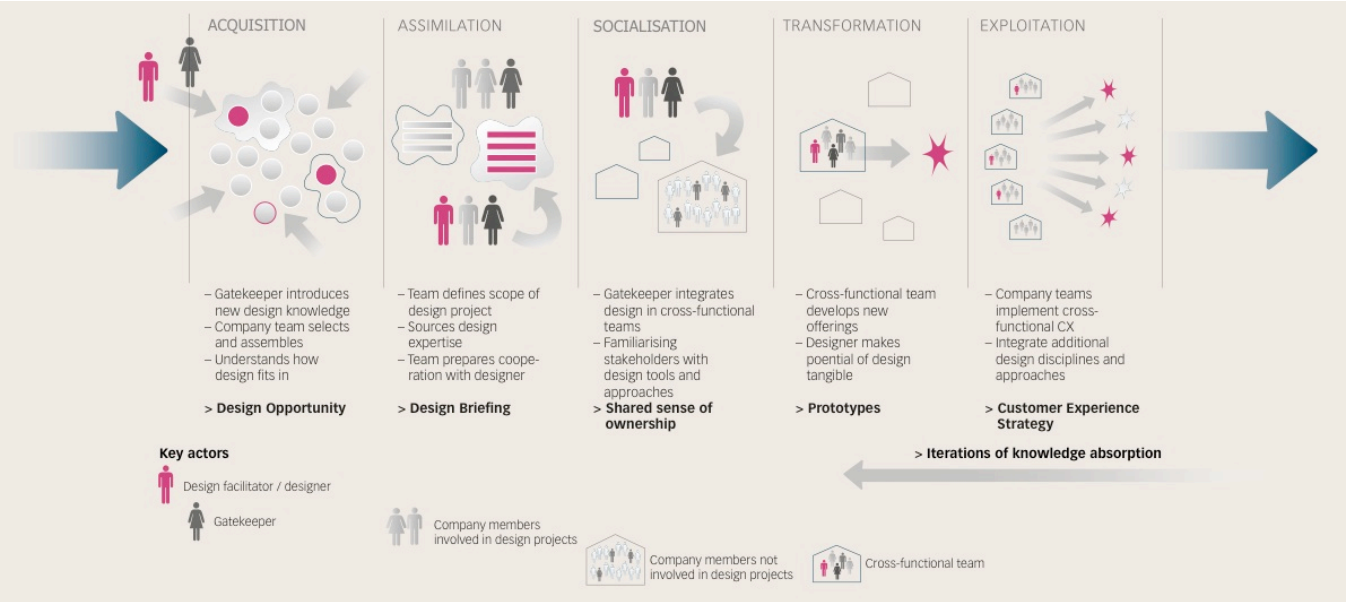

Figure 1: Narrative version of Design Management Absorption Model

- Core capabilities of design knowledge absorption and activities during ACAP: *Acquisition* consists of recognising the value of design and identifying a specific design contribution to the company's bottom line. Activities at this stage include the introduction, selection and assembly of new knowledge and the formulation of a perceived opportunity for design. *Assimilation* entails activities such as the development of appropriate structures, processes and teams, sourcing external design knowledge, and the initial steps of collaboration with the designers. *Socialisation* occupies the spot between PACAP and RACAP; more stakeholders need to be familiarised with the new knowledge e.g. in manufacture or marketing. However, socialisation is an on-going process right from the start of cooperation with a complementary knowledge source. During *transformation*, the new design knowledge is deployed effectively to improve offerings such as products, brands, services, communication, experiences, or efficiently to manufacturing or innovation processes. *Exploitation* involves the company-wide implementation of new design knowledge through integrating it into all relevant processes, coordinating functions, and aligning core values at all company touch points. – If the absorption of new design knowledge moves from potential to realised absorptive capacity through socialisation, design management can yield external outcomes as well as internal effects such as strategic flexibility and, ultimately, act as a dynamic capability.

- Key actors of ACAP are gatekeepers, complementary knowledge sources such as design facilitators or designers, company members or management functions, which are integrated during innovation activities and, and employees, which have not been familiarised with the new knowledge yet.

- Trajectories of new design management knowledge from acquisition to exploitation are displayed in the model through the use of pink like for the complementary knowledge source. Design knowledge entails processes, approaches such as human-centeredness, visualisation, experimentation, prototyping, etc., and tools as well as tacit forms of knowledge such as attitudes towards the creation of innovative solutions. The new knowledge is changing from not yet specified pieces of a puzzle to a more formalised assembly e.g. in the form of a plan (design briefing), to the embodiment in a key product, to a distributed form in single improved touch

points. During exploitation phase, additional design disciplines might be involved to deliver a coherent customer experience.

- Indicators of ACAP: Indicators are evident outcomes of the design management absorption process and support the description and measurement of the progression of the design management absorption process. They also are genuine design management instruments facilitating the learning processes in SMEs. The first one is the recognition of a *design opportunity* or the formulation of a *design strategy*, which entails the envisioned added value of new design knowledge for the company. The second indicator is a *design briefing*, which constitutes the assembled knowledge at this point in time, the direction and the scope of the design work. The design briefing also signals the commitment of the company to actually undertake design work. An indicator for the socialisation of design knowledge is the *repeated use of design approaches, concepts and tools* by more than one stakeholder. Indicators for the successful collaboration with a complementary design knowledge source during transformation phase are *design concepts and prototypes* of envisioned outcomes. Finally, an indicator for a holistic understanding of design management as a multi-layered activity to fully exploit design knowledge is a *customer experience strategy*. All five indicators can be measured using a rating system with the three levels of "complete failure", "good enough" or "full success" to evaluate companies' progression.

Data and methods

Eight companies participated in an action research project following the cycle of diagnosing, action planning, action taking, evaluating and specifying learning (Susman & Evered, 1978) irrespective of trade or target group (see Table 1). During the project, researchers acted as facilitators introducing design management knowledge, processes, and tools. The criteria for a firm to participate were: 1) a project that was novel to the company: a new product, service, or customer/brand experience. The novelty of the project for the market e.g. a plan for a radical innovation was not a condition; 2) the willingness of the company to engage in a design-driven innovation process[3] as proposed by the researchers to develop something new; 3) the willingness to include external design expertise when necessary, to commission it and to pay for it. Some of these designers were sourced with the support of a regional design programme before the start of the project, some after the initial steps of acquisition of design management knowledge.

Table 1: Companies, trade, employees, and outcomes of projects

Company	Trade	Number of employees	Outcomes of innovation projects
Company 1	Electrical engineering (Later: Manufacturer of lamps)	60 (before) 6 (After founding a spin-off)	Redesign and repositioning of an LED outdoor lamp; founding of spin-off
Company 2	Manufacturer and retailer of steam showers	10	Reengineering, redesign and repositioning of a steam shower; re-design of corporate identity
Company 3	Manufacturer of industry valves	138	Redesign of brand architecture and communication media, preparation to develop a service organisation
Company 4	Care for people with special needs	250	No outcomes
Company 5	Carpenter (kitchen)	20 (Including 5 apprentices)	No outcomes
Company 6	Manufacturer of industrial machinery	17	Reorganisation of structure, processes, workforce; search for new business opportunities connected to core technology; development of a

[3] A design-driven innovation model for SMEs had been developed in prior research (x, 2011).

			communication strategy to push new products to the market
Company 7	Industrial carpenter (built-in closets)	160	Development of a sideboard system
Company 8	Manufacturer of mass spectrometers	27	Development of a branding strategy for a high-tech OEM product (and market)

During a period of two years, 81 workshops including evaluations with the eight involved companies, many more informal meetings and talks, or the exchange of e-mails and phone calls took place. After one and a half days of initial diagnosis or analysis, companies defined a more or less sketchy design strategy. During initial as well as later workshops, researchers introduced design and design management approaches and tools with the end to support the absorption of design management capabilities. Tools were: a design driven process model; current and future customer personas; current and future brand personas; product personas; user scenarios; mood boards; customer journeys, etc.

The knowledge created during these workshops in some cases became part of the design briefing to commission design work. The researchers also initiated or participated in workshops during concept development or prototyping as well as, and later, in workshops to analyse marketing and corporate communication media, to devise a coherent customer experience strategy, or to prepare the launch of the product.

The longer the duration of the projects, the more the researcher's role changed from facilitating to giving feedback to concepts, prototypes or strategic issues, while the collaboration with designers intensified. Finally, company projects were evaluated in regard to outcomes (see Table 1) as well as the progression of design management absorption. Companies 4 and 5 dropped out of the project and Company 8 postponed the implementation of its project to later due to the market situation, but all companies self-assessed their progression by mapping it on the DMAM. A difference in perceptions of researchers and companies with respect to ACAP was discussed. An analysis of individual company case studies led to first insights on company specific obstacles or success factors of ACAP, and from a cross-case comparison emerged first *differences* and *similarities* between companies and, later, *patterns* and *themes*. In the results section of this paper, we will focus on the overarching themes of design management knowledge absorption due to limited space.

Results

Through a more in-depth interpretation of the results of individual case study analysis and the cross-case comparison five overarching themes could be identified that capture generalizable insights of company absorption. These themes point to correlations between actors, categories and the process of design management absorption, to obstacles as well as success factors of absorption or capability building.

Theme 1: Gatekeepers are acting as design champions at early stages of design management knowledge absorption in SMEs with little or no prior design experience. Being the "first absorbers" and at the same time the "design champions" creates a tension that colours the PACAP stages.

There is an intricate correlation between the gatekeepers, the triggers or reasons why they took initiative, their standing in the company, and their ability to function as a design champion introducing complementary knowledge to company members. In the researched SMEs the gatekeepers had to propagate the value of new design knowledge at a moment when they were not yet fully convinced of its added value. This made the first steps of ACAP precarious ones colouring the selection of design partners, the briefing process and the attribution of the resources to do design work. For example, in Company 4 employees questioned why they had to participate in a design project and the CEO was unable to provide a satisfactory justification. All gatekeepers' relationship to design and design management approaches often

remained ambivalent until first results became visible, which happened during RACAP stages. This was also true for firms such as Company 7 or 2, which later successfully developed a new product. If it took too long, before satisfying results became tangible, the gatekeeper aborted a project at a too early stage making RACAP impossible. E.g. Company 5 was not satisfied with first prototypes and doubted the designer's capability; this was further acerbated by the fact of limited resources. In one case, the personality of the gatekeeper was instrumental: In Company 1 design was relegated to a position, from which it is not able to fully operate, because of the CEO's strong personal vision. In Company 7 with less centralised power, the gatekeeper encountered problems at the opposite side of the spectrum; the "democratic" character of the company hampered his role as a gatekeeper.

Theme 2: Stimulants for a good transition from PACAP to RACAP are a design strategy encapsulating a perceived business opportunity and the preparation of the cooperation with an external knowledge source.

The observed stimulants of design management absorption during PACAP and the preparation of the transition to RACAP were twofold:

a) Scope and strategic intent: The clearer the formulation of the scope of the innovation project and the strategic intent connected to it, the smoother the acquisition and assimilation of design management knowledge. Companies 2, 3, 6, and 7 early on understood the design management concept of aligning brand values throughout all touch points. As a result many initial strategies were further differentiated at the exploitation stage in the form of customer experience strategies, anticipating during PACAP objectives concerning the RACAP phases and preparing a smooth transition from PACAP to RACAP.

b) Preparation of cooperation with a complementary knowledge source: For all companies to formulate a design strategy was difficult because it necessitates specific design leadership capabilities. To facilitate the formulation of strategies and briefings and the selection of a suitable designer a link to some external knowledge source introducing design management concepts was necessary[4]. For the researched SMEs the strategies as well as the most effective briefings were pragmatic and to the point. When design was presented as the panacea to all ailments of the company by facilitators or design agencies, this caused distrust or resistance on the side of the SME (Companies 4, 5).

Theme 3: Similarities versus complementarities of new design management knowledge create a paradox[5] for SMEs as well as for designers that can limit absorptive capacity.

The absorptive capacity construct emphasises the fact that new knowledge needs to be related or similar to the firm's existing one to be more easily received. On the other hand, the new knowledge source needs to be complementary to existing knowledge to be considered as helpful for the company. This tension created a paradox that some companies were more able to deal with than others. The successful Companies 6 and 7 stated during evaluation interviews that the collaboration with designers was founded on an attitude of curiosity and openness. If the new knowledge was – only allegedly – considered too similar, this caused the breaking off of some of the projects (Companies 4, 5). In Company 4, social pedagogues and designers competed in their use of the notions of "creativity" and "empathy" without noticing that they actually used them differently. If the new knowledge differed too much it was not perceived as complementary but as alien, and – again – this caused the end of new knowledge absorption. In Company 8, the designers presented concepts for a container for a high-tech instrument, which was inspired by the product language from the consumer goods sector, which caused the rejection of the concept.

[4] There was one exception (Company 6) that already had worked with a designer before and had been involved in a prior applied research project of the author of this paper.

[5] „A seemingly absurd or contradictory statement or proposition which when investigated may prove to be well founded or true." (Oxford dictionary online, accessed July 2012)

Theme 4: Design capabilities are built through the use of design tools but design and design management concepts and approaches create a long-term value.

Tools such as user scenarios, customer or brand personas, customer journeys, etc. supported the exploration of business opportunities, (future) user needs, or even the formulation of strategy. With these tools tacit knowledge of company members such as sales representatives, engineers or product managers was made explicit and company-specific knowledge was being created. While many of the eight companies remembered these tools, only a few actually re-used them. What at first sight appears to be a failure of design management knowledge absorption proved not to be the case for the more successful SMEs (Companies 2, 3, 6 and 7). These firms declared to have understood a series of design and design management concepts and through those to have learned to look at their businesses from a different perspective. The following design as well as design management concepts were mentioned as the most important ones: user-centeredness or to look at a product or service from a user's perspective; cross-functional teamwork; emotionality or making company values and strategies visible; product language or telling a story with a product; alignment of company values and product language; orchestration of company touch points through the adoption of an outside-in perspective to analyse and improve all interfaces with stakeholders; story and visualisation to drive change.

Theme 5: Design management starts to become a dynamic capability after design management absorption has moved into the exploitation phase and further into a next iteration of knowledge absorption.

For most companies the decision to integrate new design management knowledge constituted a leap of faith. They needed evidence that design "works". Once design concepts had progressed to advanced prototypes in transformation phase leading to the prospect of business success, Companies 2, 3, 6, and 7 were willing to invest more resources: firstly, in a more coherent customer experience (Companies 2, 3, 7); secondly, in possible future innovation or design projects (Company 7). Thus, in these companies trust that design management can help to gain and sustain competitive advantage was built at the very end of the design management absorption process, during exploitation phase or beyond in a next iteration of design management absorption. As observed in Company 7, which already worked with a trusted design partner before, the propensity of design to innovate became a valuable resource and design management was understood as an organisational capability and driver of innovation and change.

Discussion

To initiate the acquisition of design management knowledge it takes an external and/or internal trigger and an open-minded gatekeeper with a strategy or with enough curiosity what design can add to the company. His conviction and his standing in the company are instrumental to socialise design knowledge at a later stage of knowledge absorption. Since at early stages of ACAP the value of the new knowledge is fuzzy, the gatekeepers will have to have caught a glimpse of the potential of design as a strategic resource. For this purpose, they need to have been in contact with some external knowledge source that communicates the value of design, be it a design promotion programme, a designer, a university, or some other "weak tie" (Granovetter, 1973) of a firm's network. This insight supports the necessity of design support programmes to sensitise SMEs to design as a strategic resource and a driver of innovation (Boult, 2006).

While a (sketchy) design strategy opens a window of opportunity for companies with little or no design experience, the formulation of a design briefing is a first act of taking ownership of the project and of design's place in it. During negotiations between the company and the designer regarding the briefing or other contractual issues, the foundations for the working relationship with the complementary knowledge source are built. While this is common knowledge in practice, this study indicates that a design briefing anticipates the outcomes of later design activities and thus functions as a bridge from PACAP to RACAP.

In spite of design briefings, some conflicts between designers and companies emerged. While experienced companies are familiar with the paradox of related as well as different knowledge and even encourage divergent thinking as an innovation capability, for SMEs with little or no prior design experience, divergence easily is perceived as a transgression and causes distrust or even the end of design projects. Early rejection of design and design management approaches, however, also seem to be rooted in the lack of human and financial resources. So proposed design activities need to be to the point and pragmatic to be well received.

Also, design management concepts, which are more related to management approaches, can pave the way for more unfamiliar ones. So seen from an absorption perspective, the mediating role of design management is one of bridging the related and the complementary. To be aware of the paradox or to reflect on its dynamics, e.g. of different value systems of professional groups, is a first step towards balancing these opposites and to improve the quality of the cooperation between companies and the complementary knowledge source.

Conclusions

There exists a vast amount of literature on characteristics of design such as the ability to diverge and converge or to iterate (e.g. Lawson, 2004; Conley, 2004); there also exists a study on external designers in product design processes of small manufacturing firms (Berends, et al., 2010). This paper, however, does not look at it from a design perspective alone but also from the point of view of how companies with little or no design experience learn to deal with design at times being divergent and "different". This is an important perspective for the practice as well as for theory. The absorption or learning perspective is a complex one; it is a multi-level and multi-stakeholder endeavour. We propose to conceptualise design and design management as knowledge that first has to be learned either through the early integration of a design facilitator or through a designer. On one hand, designers will need an accurate understanding of absorption as multi-level and multi-stakeholder processes including ambivalence from the side of SMEs. On the other hand, SMEs with little or no design experience will have to learn to use design management as a mediator between prior and complementary knowledge, before a productive interaction with design's divergent characteristics in innovation projects can occur. To actually understand the long-term impacts of the newly absorbed design management knowledge, longitudinal studies would be necessary. Another limitation exists on the methodological side; to research absorption processes e.g. through action research schemes is time-consuming, which limits the size of the sample of SMEs.

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