THE ABSORPTION OF DESIGN MANAGEMENT CAPABILITIES IN SMEs WITH LITTLE OR NO PRIOR DESIGN EXPERIENCE

CLAUDIA ACKLIN
LUCERNE UNIVERSITY OF APPLIED SCIENCES
AND ARTS – ART & DESIGN
CLAUDIA.ACKLIN@HSLU.CH

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.

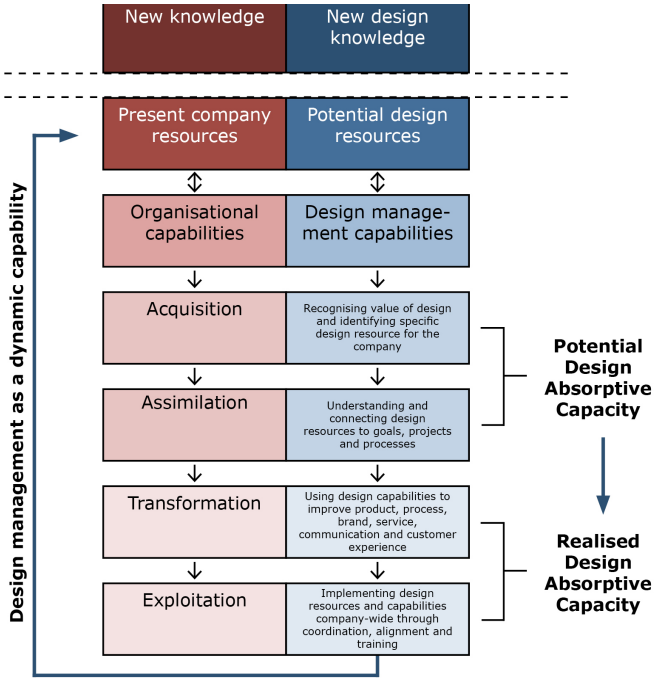

Figure 1: Design Management Absorption Model

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.

ACKNOWLEDGEMENTS

This paper is based on an applied research project funded by CTI, the Swiss Confederation's Innovation Promotion Agency (http://www.bbt.admin.ch/kti/index.html?lang=en).
Many thanks go to my colleague Dagmar Steffen who was part of the research team, commented the paper and added her observations. Also Swiss Design Transfer, a regional design support organisation, represented by Oscar Steffen, was a partner in this research project (http://www.swissdesigntransfer.ch).

REFERENCES

(2009). Design as a driver of user-centred innovation. C. o. t. E. Communities. Brussels, Commission staff working document, SEC(2009)501 final.

Abecassis-Moedas, C. and S. B. Mahmoud-Jouini (2008). "Absorptive Capacity and Source-Recipient Complementarity in Designing New Products: An Empirically Derived Framework." The Journal of Product Innovation Management **25**(5): 473-490.

Acklin, C. (2010). "Design-Driven Innovation Process Model." Design Management Journal **5**(1): 50-60.

Acklin, C. and H. Hugentobler (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. "focused", Bern.

Barney, J. (1991). "Firm Resources and Sustained Competitive Advantage." Journal of Management **19**(1): 99-120.

Boland Jr., R. J. and F. Collopy (2004). Managing as Designing. Stanford, Standford University Press.

Borja de Mozota, B. (2003). Design Management. Using Design to Build Brand Value and Corporate Innovation. New York, Allworth Press.

Borja de Mozota, B. (2006). "The Four Powers of Design: A Value Model for Design Management." Design Management Journal **17**(2): 44-53.

Boult, J. (2006). "Emerging Demands and Challenges for Design Support." SEEDesign Bulletin: 6-7.

Brown, T. (2008). "Design Thinking." Harvard Business Review **86**(6): 84-92.

Brown, T. (2009). Change by Design. How Design Thinking Transforms Organizations and Inspires Innovation. New York, Harper Collins.

Bruce, M. and J. Bessant (2002). Design in Business. Strategic Innovation through Design. Essex, Pearson Education Limited.

Bruce, M., R. Cooper, et al. (1999). "Effective design management for small businesses." Design Studies: 297-315.

Chiva, R. and J. Alegre (2009). "Investment in Design and Firm Performance: The Mediating Role of Design Management." Journal of Product Innovation Management **26**: 424-440.

Cohen, W. and D. Levinthal (1989). "Innovation and Learning: The Two Faces of R&D." The Economic Journal **99**(September 1989): 569-596.

Cohen, W. and D. Levinthal (1990). "Absorptive Capacity: A New Perspective on Learning and Innovation." Administrative Science Quarterly **35**(1): 128-152.

Cooper, R. and M. Press (1995). The Design Agenda. A Guide to successful Design Management. West Sussex, John Wiley & Sons Ltd.

Dickson, P., W. Schneider, et al. (1995). "Managing Design in Small High-Growth Companies." The Journal of Product Innovation Management **12**: 406-414.

Dumas, A. and H. Mintzberg (1989). "Managing Design / Designing Management." Design Management Journal **1**(1): 37 - 43.

Kelley, T. and J. Littman (2004). The art of innovation. London, Profile Books.

Kootstra, G. (2009). The Incorporation of Design Management in Today's Business Practices. An Analysis of Design Management Practices in Europe. The Hague and Rotterdam, Design Management Europe (DME) consortium.

Kotler, P. and G. A. Rath (1984). "Design: a Powerful But Neglected Strategic Tool." Journal of Business Strategy **5**: 16-21.

Lazonick, W. (2005). The Innovative Firm. The Oxford Handbook of Innovation. J. Fagerberg, D. C. Mowery and R. R. Nelson. New York, Oxford University Press.

Martin, R. (2009). The Design of Business. Why Design Thinking Is the Next Competitive Advantage. Boston, Harvard Business Press.

Nelson, R. R. and S. G. Winter (1982). An Evolutionary Theory of Economic Change. Cambridge Mass., Harvard University Press.

Nonaka, I. (1994). "A Dynamic Theory Knowledge of Organizational Creation." Organization Science **5**(1): 14-37.

Nonaka, I. and H. Takeuchi (1995). The Knowledge-Creating Company. How Japanese Companies Create the Dynamics of Innovation. Oxford, Oxford University Press.

Perks, H., R. Cooper, et al. (2005). "Characterizing the Role of Design in the New Product Development: An Empirically Derived Taxonomy." Journal of Product Innovation Management **22**: 111-127.

Platts, K. W. (1993). "A process approach to researching manufacturing strategy." International Journal of Operations & Production Management **13**(8): 4-17.

Utterback, J., B. A. Vedin, et al. (2006). Design-inspired Innovation. Hackensack, World Scientific Pub Co.

Von Stamm, B. (2008). Managing innovation, design and creativity. Chichester, Wiley.

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