

Learning Design Thinking: International Design Business Management at Aalto University

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Abstract

While the design profession has long been calling for wider diffusion into the business enterprise context of methodologies, tools and approaches, applied in design activity, it is only in the last decade that firms and organizations have started to regard “designerly” ways of doing things as a real option for enhancing their products, services and customer interaction. However, while “design thinking” has become a fashionable catchword, it is not so clear what are the underlying assumptions that underpin the concept and how these assumptions affect the process of learning design thinking. In this paper, through a process of deconstruction, the key elements of “Practices”, “Cognitive Approaches” and “Mindset” are reviewed and their relationships charted, with the aim of providing a basic conceptual approach for learning design thinking in higher education. The paper reviews three cases studies in master's degree level education within the International Design Business Management program of the Aalto University, suggesting that educating future design professionals in collaborative work through extensive real-life business projects creates abilities that are needed in design thinking. Multidisciplinarity and abductive reasoning, together with problem- and practice-based learning approaches, facilitated by interdisciplinary faculty, are the elements that underpin educating the future design thinkers, vitally needed in the innovation economy.

Keywords: Capability development. Design business. Design thinking. Higher education. Innovation ecosystems. Multidisciplinary teams.

1 Introduction

1.1 Design creating a difference

For decades, the design profession has been calling for businesses to adopt design methods, tools and approaches to improve their performance, create novelty and inimitable solutions that can deliver real competitive advantages. Some enterprises have done just that, and created wonderfully resilient innovation ecosystems for themselves with and through design. However, the majority of enterprises have not, and so the potential contribution of design as a corporate function, both in management and as the specific application of design capabilities, still remains mostly unexplored. But design can clearly make major contributions to business enterprise through enhanced functionality, usability, or aesthetics of products, services and customer interfaces, through lower operational costs or an improved service delivery processes, to name a few. As Borja de Mozota (2011) notes, user oriented design and innovation improve both products and processes in terms of attributes and delivery. This user and demand led approach changes traditional "stop/go"-innovation models, requiring collaborative work, making it necessary for business leaders to find people who can teamwork, experiment, apply systemic and holistic thinking, and are able to mix and talk outside of their own academic silos. In other words, businesses need design thinking (DEW, 2007; DREWS, 2009; MARTIN, 2009).

Over the last decade, design thinking has been introduced as a way of creating solutions that go beyond conventional analytical methods. Building on the ideas of creativity, innovation and systemic thinking, this holistic and iterative approach can be seen useful in multiple business contexts. While the latest wave of design thinking writing has emerged mostly in the area of management, the roots go back three decades, to the thinking on reflective practice and creativity (SCHÖN, 1983; LAWSON, 1980), and in some cases the latest writing on the matter has been critiqued as being nothing more than a recurrence of old ideas. The definition of design thinking remains still ambiguous, resulting in multiple parallel approaches that partly overlap while being partly distinct.

The recent extensive interest in design thinking takes design into new areas of involvement with businesses in terms of collaborative contexts of innovation, services, organizational design and strategic applications, to name a few. Thus design is achieving a wider than ever impact, which translates into enhanced possibilities to create sustainable, user-friendly solutions for the everyday; in other words, new opportunities to contribute positively to human well-being. It is also transforming the design industry from a specialized collectivity of individuals into a wider multidisciplinary community of creative practice.

1.2 The human factor

But there are also other implications of this expansion. Where do the individuals that are expected to operate in these creative communities of practice come from and how does one educate them? This is an essential question in terms of industrial transformation, as the conventional wisdom indicates that training a designer to become a full professional takes ten years: an initial five years of study and another five years of hard practical hands-on work in studio-like settings, where mentors with extensive practice teach their apprentices the real work applications of the skills gained in the first five years. The key issue is that in today's fast changing world ten years is too long time to wait for the maturity of future professionals. Whole industries emerge and fade at such a pace that a decade long time lag is not an option. Would it be possible to fast track this formative process? And how could that be achieved?

In this paper we examine the concept of design thinking from a learning perspective: what are the constitutive elements that one has to address in learning design thinking? And how does one set up a learning experience that is effective and enables a shorter formative timeframe? In the first section of this paper, the constitutive elements of design thinking are introduced following the recent work of Hassi and Laakso (2011), after which a detailed analysis examines key learning challenges and opportunities. The paper proceeds to develop a model of design thinking education that is based on the practical experiences of running the International Design Business Management (IDBM) program of the Aalto University, in Helsinki, Finland, since 1995. The program has had the aim to educate future professionals in the operational complexities of high value added innovation settings, through combining design, technology and business skills. The paper furthermore suggests potential research avenues intended to deepen the knowledge of the pedagogical aspects of learning design thinking.

2 Dissecting design thinking

2.1 Three dimensions of design thinking

This paper adopts the framework of Hassi and Laakso (2011)¹ to describe design thinking under three main constitutive components: "Practices", "Cognitive approaches", and "Mindset" (see Figure 1).

The presented framework of Hassi and Laakso (2011) is based on an extensive literature review and interviews with key industry experts; it is furthermore based on an approach that avoids defining design thinking in a reductionist fashion, however distilling the essential elements from key sources into one unified framework. For the purposes of this

¹ The research that led to the paper has been extensively funded by the IDBM programme, being a part of the research agenda related to the valuation of design.

paper, this methodology is maintained here; i.e. we do not present a definition of what is learning design thinking, but we examine the elements that this learning should involve and the needed approaches, tools and techniques in each case.

PRACTICES	COGNITIVE APPROACHES	MINDSET
<ul style="list-style-type: none"> • HUMAN-CENTERED APPROACH E.g. People-based, user-centered, empathizing, ethnography, observation (e.g. Brown 2008; Holloway 2009; Ward et al. 2009) • THINKING BY DOING E.g. Early and fast prototyping, fast learning, rapid iterative development cycles (e.g. Boland & Collopy 2004; Lockwood 2010; Rylander 2009) • VISUALIZING E.g. Visual approach, visualizing intangibles, visual thinking (e.g. Carr et al. 2010; Drews 2009; Ward et al. 2009) • COMBINATION OF DIVERGENT AND CONVERGENT APPROACHES E.g. Ideation, pattern finding, creating multiple alternatives, (e.g. Boland & Collopy 2004; Drews 2009; Sato et al. 2010) • COLLABORATIVE WORK STYLE E.g. Multidisciplinary collaboration, involving many stakeholders, interdisciplinary teams (e.g. Dunne & Martin 2006; Gloppen 2009; Sato et al. 2010) 	<ul style="list-style-type: none"> • ABDUCTIVE REASONING E.g. The logic of “what could be”, finding new opportunities, urge to create something new, challenge the norm (e.g. Fraser 2009; Lockwood 2009; Martin 2009) • REFLECTIVE REFRAMING E.g. Rephrasing the problem, going beyond what is obvious to see what lies behind the problem, challenge the given problem (e.g. Boland & Collopy 2004; Drews 2009; Zaccai in Lockwood 2010) • HOLISTIC VIEW E.g. Systems thinking, 360 degree view on the issue (e.g. Dunne & Martin 2006; Fraser 2009; Sato 2009) • INTEGRATIVE THINKING E.g. Harmonious balance, creative resolution of tension, finding balance between validity and reliability (e.g. Brown 2008; Fraser 2009; Martin 2010) 	<ul style="list-style-type: none"> • EXPERIMENTAL & EXPLORATIVE E.g. The license to explore possibilities, risking failure, failing fast (e.g. Brown 2008; Fraser 2007; Holloway 2009) • AMBIGUITY TOLERANT E.g. Allowing for ambiguity, tolerance for ambiguity, comfortable with ambiguity, liquid and open process (e.g. Boland & Collopy 2004; Cooper et al. 2009; Dew 2007) • OPTIMISTIC E.g. Viewing constraints as positive, optimism attitude, enjoying problem solving (e.g. Brown 2008; Fraser 2007; Gloppen 2009) • FUTURE-ORIENTED E.g. Orientation towards the future, vision vs. status quo, intuition as a driving force (e.g. Drews 2009; Junginger 2007; Martin 2009)

Figure 1 - The three-dimensional framework of design thinking (HASSI; LAAKSO, 2011, p. 59)

2.2 Towards relevant practices

Out of the identified “Practices” elements of i) human-centered approach, ii) thinking by doing, iii) visualizing, iv) combination of divergent and convergent approaches, and v) collaborative work style, it is the last one that emerges as the key challenge, as it underpins the other elements in many ways. In terms of learning design thinking, the elements in the “Practices” category are related to instrumental competences by which students learn the ways of multidisciplinary collaboration and develop their cognitive approaches, which underpin the systemic capabilities that are manifest in the “Mindset” category.

The days of the lone innovator have ended and most of the high value added, knowledge intensive work is based on collaboration, both across functions and cultures. Unless future professionals are able to contribute to collaborative work styles even in situations of extremely high ambiguity, their value to their organisations will be significantly reduced. While the key authors (BROWN, 2008; CLARK; SMITH, 2008; DUNNE; MARTIN, 2006; HOLLOWAY, 2009; LOCKWOOD, 2010; SATO et al. 2010) agree that multi- and interdisciplinary teams are at the very core of innovation and can find solutions to “wicked problems” (BUCHANAN, 1992; GLOPPEN, 2009), in practice it is highly challenging to create learning programs where real advances in multidisciplinary and multicultural teamwork are reached. Successful collaborative teamwork paves the way for the related integrative mindset (DUNNE; MARTIN, 2006).

Multidisciplinary teamwork and collaboration also enables divergent and convergent approaches, when zooming in and out of the issues at hand. Multiple alternatives are most often needed in order to widen the scope of analysis (DREWS, 2009), and to inform selection and synthesis in the search of a balanced optimum (BOLAND; COLLOPY, 2004); this almost invariably includes examining conflicting and ambiguous, non-commeasurable patterns and relationships (BROWN, 2009; CARR et al. 2010, SATO et al. 2010). It should be noted that searching for an optimum balance in solutions entails technical and non-technical considerations, social arrangements, acceptability and the potential for diffusion; in other words, examining innovation from a wide perspective.

While collaboration underpins all practice, Hassi and Laakso (2011) identify a key approach that is essential in design thinking: “practice-based learning”, or “learning by doing”. In order to arrive at balanced optimum solutions, teams must observe the human circumstance from multiple angles (BROWN, 2008; PORCINI, 2009; WARD et al. 2009), making sense through user centric involvement with embodied empathy and understanding (BROWN, 2008; CLARK; SMITH, 2008; HOLLOWAY, 2009; JUNGINGER, 2007). This may involve also collaborative design (BOLAND; COLLOPY, 2004; BROWN, 2008), user-driven innovation (VON HIPPEL, 1988) and more detached observational and ethnographic methods (BECKMAN; BARRY, 2007; BROWN, 2008; CARR et al. 2010; DUNNE; MARTIN, 2006); all are needed to construct a deep and empathetic understanding. But the key issue in these processes is to take the learning from these observations and understanding and to create new knowledge through experimentation, reflection (RYLANDER, 2009) and rapid systematic iteration (CARR et al. 2010; HOLLOWAY, 2009; LOCKWOOD, 2010; SATO et al. 2010). Prototyping and simulations make concepts concrete (SATO et al. 2010), idea formulation (LOCKWOOD, 2009) and continuous experimentation through prototypes provides a tool that can be used to explore ideas and stimulate thinking (DREWS, 2009; FRASER, 2007; FRASER, 2009; HOLLOWAY, 2009). It is argued that multidisciplinary teams add to the variety, depth and quality of the exploration (DAHLIN et al. 2005, BANTEL; JACKSON, 1989; BANTEL,

1993; MANNIX; NEALE, 2005). In these explorations, teams do well to visualize their process, outputs, and outcomes, especially if and when intangible products and services are involved (CARR et al. 2010; DREWS, 2009; SATO et al. 2010), adding to verbal and written information.

2.3 New cognitive approaches

Learning from practice, iteration, experimentation, prototyping, visualizing and other experimental methods leads inevitably to the rejection of both inductive and deductive reasoning as the epistemological and ontological foundation of design thinking. If the idea is to create new knowledge through a reasoning process that involves “what could be”, then abductive logic is needed (FRASER, 2009; LOCKWOOD, 2009), where one does not prove that something works through observation only. Abduction accommodates the iterative explorations of designers (DEW, 2007). Still yet, as part of the process, reflective practice is needed. Hassi and Laakso (2011) refer to “reflective reframing” to illustrate the ability to see new ways of looking at the problem. This is intimately linked to the ability of scaling the issues in multiple directions, supported by collaborative work practices (BOLAND; COLLOPY, 2004; DEW, 2007; DREWS, 2009). The processes of actually identifying, framing, and reframing the problem constantly during the work process at hand is as important as arriving at a balanced optimum solution (BECKMAN; BARRY, 2007). Very often the complex issues at hand require a holistic and systemic perspective (HOLLOWAY, 2009), connecting internal with the external, seeing the issues at hand through not only structures, but also through socioeconomic patterns, relationships and dependencies (SATO, 2009). In this context, integrative thinking is needed to identify the salient aspects and to carry two or more potentially conflicting ideas forwards, generating solutions that have a “both-and” nature instead of “either-or” (BROWN, 2008; FRASER, 2009; DUNNE; MARTIN, 2006). As Hassi and Laakso (2011) note, this is needed to balance technical-business and human dimensions (BROWN, 2008; CLARK; SMITH, 2008; HOLLOWAY, 2009), with other pairs such as human-versus company centricities, reliability with validity (MARTIN, 2009; SATO, 2009), exploitation with exploration (MARTIN, 2009), and analytical thinking with intuition (MARTIN, 2009, PORCINI, 2009; SATO et al. 2010).

2.4 And finally: a mindset to be achieved

Borrowing still yet from the approach proposed by Hassi and Laakso (2011), we understand a mindset as the orientation that exists both in individuals and in the corporate cultures at hand. This is indicative of how the problems are approached. Design is about creating futures, thus implicitly looking for new opportunities, new ways of doing things (MARTIN, 2009; PORCINI, 2009). As design is also linked to creating

balanced optimums (i.e. improved states), the idea implicitly contains a view that this can be achieved, and thus designers tend to be optimistic about their abilities to achieve enhanced solutions and alternatives (BROWN, 2008; FRASER, 2007). Constraints can be seen as positive challenges (DUNNE; MARTIN, 2006).

But the key issue in the mindset of design thinking is related to experimentations and exploration (BROWN, 2008). Design thinking involves the idea of taking risks to explore and expand the limits of both technology and social arrangements in organizations (HOLLOWAY, 2009). This is an iterative process, with embedded mistakes that form a part of the process. Questioning in new ways and directions enable alternatives that could not be foreseen. The key objective becomes to experiment through quick failures that direct and instruct (BROWN, 2009; LOCKWOOD, 2010). In order to do this, individuals must have a very high tolerance to ambiguity and work through emerging solutions instead of deterministic ones (RYLANDER, 2009). Developing collaborative working methods that can absorb and deal with high levels of ambiguity is a major challenge, as typically the current school and first cycle higher educations do not prepare students for this.

3 Learning design thinking

3.1 Emerging view on learning challenges

What emerges from the previous sections? What are the key issues that need to be carefully thought about when learning design thinking? It is here argued that collaborative work is both the key vehicle for innovation to happen and at the same time the key challenge in terms of learning needs. The fact that multidisciplinary teams forward the limits in their areas implies that the teams (and evidently individuals in teams) have to be highly resilient to ambiguity. Also, as the teams push the limits, they are forced into an abductive logic mode, as induction/deduction no longer works. They are also forced into exploration, as they are creating new knowledge, which they can only achieve through learning by doing and through experimentation. As strategies to deal with the unknown are known to require both learning and experimentation, the teams need to have open minds, widely verify the possibilities and options available, and think systemically, in a holistic and integrated manner.

In sum, it is argued that the required culture of collaboration in work is the key driver in learning design thinking. This means in practice multidisciplinary teamwork, which is often linked to multicultural aspects. But the argument continues: significant learning can only be achieved if the challenges for the collaboration in the teamwork are very real and tangible; a sense of urgency and real term relevant context are also needed. Overall, team assignments tend to have unsatisfactory results in higher education if they are not

grounded in a real life case; in other words, really learning by doing, and not pretending to be learning by doing.

On another level, we can also ask whether universities are able to rise to the challenge of enabling multidisciplinary learning? The evidence is not very encouraging. As an example, siloed business studies programs have become often alien to the business community (e.g. MINTZBERG, 2004; NAVARRO, 2008; SCHOEMAKER, 2008) and even basic systemic skill development is lacking (BOOTH et al. 2000). Promotion in academia is based on research and not practical applications of working in real life contexts. Faculty and graduates find it difficult to cross functional divides, link systems, technologies, and innovate with new packages of offering, in other words, innovate.

3.2 Multidisciplinary teamwork

As it has been noted, obtaining benefits from design and design thinking requires ways of working that bring together experts with different professional backgrounds (DAHLIN et al. 2005). Research has demonstrated that multidisciplinary teams are able to achieve a higher level of innovation (BANTEL; JACKSON, 1989), while also being able to develop superior strategies (BANTEL, 1993). They appear to be better in introducing organizational changes (WILLIAMS et al. 1995), and diversity in teams increases the prospect of knowledge sharing and also the very breadth of knowledge itself (MANNIX; NEALE, 2005). Teams that are multidisciplinary are thus assumed to be able to achieve superior quality and creative performance (MANNIX; NEALE, 2005). Bunderson and Sutcliffe (2002) argue that multi-knowledge individuals (i.e. persons with a diverse professional background in two or more fields) can significantly enhance multidisciplinary team performance. Douglas and Strutton (2009) suggest that superior performance requires functional competences, reciprocal understanding, and cross-functional communication. Clearly, evidence is building up that teams with diverse backgrounds are instrumental not only in terms of design thinking, but also in terms of innovation performance. With all this understood, it is still not clear how multidisciplinary can be learned; to approach this challenge, we turn to learning in practice in the next section.

3.3 Developing practical abilities

As Allen and Young (1997), demonstrate, active experience enables superior learning. On another line of enquiry, Webber (2005) argued for the importance of real life industry experience in teaching relevant and coherent business and organizational skills. In today's world, globalization is a major driver of change and projects done in international contexts enable learning and linking of global approaches to knowledge with local ways of knowing (SANDERSON, 2001).

When one examines the learning of practical abilities, the processes should be both constructive and collaborative. Learners are motivated to solve the problems presented in real life contexts (TIEN et al. 2005). As one of the major approaches, "problem-based learning" (PBL) has emerged in the last 20 years as a method to achieve effective, high quality, self-directed and autonomous learning. PBL develops not only critical and reflective thinking skills, but also with integration of disciplines it addresses multidisciplinary issues. Tien et al. (2005) have indentified the four phases in the PBL process: selecting a problem, designing actions, determining learning objectives and linking contents.

In teaching multidisciplinary collaborative working, the instructor must adopt a role as a facilitator of the process, giving up control and preplanned scripts. There exists a constant challenge to find the balance between highly structured and goal driven teaching delivery, and the flexibility that emerges through improvisation, when participants practice negotiation and the collective process of constructing their own knowledge (SAWYER, 2004). In this process, authentic problems help later on to use the gained knowledge (EDELSON; REISER, 2006).

In developing a challenging learning situation in a multidisciplinary setting, the problem should be complex enough, so that cooperation from all members of the team will be necessary in the effort for an optimized solution. In many cases, project management tools, approaches and principles are useful in learning: they help create structure for both the goal-setting and the processes utilized to achieve the aims. Structure reduces the ambiguity that is inherent in processes that involve abduction, sense-making, creativity, and the use of design thinking tools and methods overall.

On another level, PBL enables the learner to benefit from learning communities and the learner from social interaction, giving him/her a central role in the process as a key contributor in a multidisciplinary group. Together with the respect of the other members of the team/community, this role helps the student to learn and to build up his identity as an expert (LAVE; WENGER, 1991). In the best cases, learners are not taught the knowledge as such; and they are not consumers of the existing knowledge. Rather, they become the co-creators of and producers of new knowledge, which is the fundamental skill requirement in the knowledge economy (SAWYER, 2006). In this way the pedagogical approaches of PBL underpin the thinking of how to learn design thinking and thus innovation. Learners are not seen as clients but as key participants of the learning community (SCARDAMALIA; BEREITER, 1999).

In terms of pedagogy, it is a significant challenge to build up a common language across disciplinary boundaries. There also exists a major challenge to build up the trust in the relevance and depth of the team mates' previous knowledge and experience. This trust is required to achieve reciprocal understanding and cross-functional communication

(DOUGLAS; STRUTTON, 2009) in multidisciplinary situations. Collaborative work needs to build partly on the individuals' previous knowledge and experience to create and share objectives for the project. This is especially true when the activities take place on cross-disciplinary boundaries such as the one between art and science, where different ways of thinking and experiencing traditionally exist (ROBINSON, 2001). As an example, science represents objectivity, intellect and hard facts while art deals with intuition, expression, emotions and soft reality. This requires negotiation between the ideas deriving from different disciplines; this is a natural place for design thinking.

4 Thinking design before design thinking

4.1 IDBM program in search of excellence in collaborative work

In this section, we will examine the model for teaching and learning collaborative work which we have developed over the last decade and a half within the International Design Business Management (IDBM) program, first as a joint initiative of Helsinki School of Economics, University of Art and Design Helsinki and Helsinki University of Technology, and since 2010 within the context of the new Aalto University. IDBM was launched in 1995 to cater for the master's degree educational needs and collaboration between academia and the design industry; presenting a new approach to join business, technology and design studies that, widely speaking, built on the platform of problem based learning, through practical collaboration with industry. The program was teaching collaborative work methods through real-life projects in design-intensive industrial settings, using design tools and methodologies much before this approach was coined as design thinking.

The IDBM program has an aim to enable world-class multidisciplinary and systemic learning in real life context and to promote research in global business development through design and technology. The program has educated close to seven hundred master's level students from over twenty countries, with over one hundred and fifty completed industry projects. Projects have been undertaken with close to a hundred business and organizational partners, in Finnish and global contexts. Over the years, a wide community of practice has been formed around the program.

IDBM is a two-year masters degree program, which, in addition to interactive and focused subject study courses in business studies, engineering, art and design, incorporates an academic year long industry project. The project facilitates a problem-, practice- and project-based learning setting within the real life business enterprise practice. The program has been highly successful, first and foremost, due to the commitment of the masters level students to the program; the faculty commitment to teaching; a constructivist view on learning and pedagogy; the interdisciplinarity of the faculty itself; the problem/practice/project perspective emphasizing hands-on learning;

the real life contexts; the wide community of alumni; and very agile approaches in setting up of collaborative projects.

4.2 Industry projects

At the very core of IDBM is a real life project sponsored by a company; this can include developing brand and product strategies, scouting out future trends, creating new product concepts, future environments of product, market studies, developing corporate identities, brands, communications and design management, to name a few topics. Participating companies work together with the students for one academic year and pay a modest fee covering the required study trip abroad and out-of-pocket expenses. The multicultural and multifunctional teams are made of 4-5 students, with at least of one designer, one engineer, and one business student. Diversity also exists through gender and nationality.

The teams are supervised and supported by the senior faculty and industry experts in the field of the assignment; the coaches need to have cross-cultural and multidisciplinary experience to be able to efficiently and competently mentor these teams. In addition, the teams are supported by courses running along the industry project providing them with the tools and skills needed. Moreover, peer review is also conducted at times.

The assignments are typically open-ended and sometimes have a wicked nature, implying that multiple possible solutions can be found; thus abduction is needed in the search of balanced optimums.

5 Case studies

To illustrate the learning approach, we introduce three short case studies of IDBM industry projects that have been especially challenging and relevant for learning open-ended design thinking. They represent extreme learning experiences, where the multidisciplinary team is expected to create clear, unique, and sustainable contributions to business and social innovations during the year. Each of the projects is linked to design methods and practice in multiple ways. Design today needs to be seen in a wide way, involving not only products, but also services, environments and systems, as stipulated by Buchanan already in 1992. In the cases, design inputs range from products to services and to systems; some of them have social aims, while other are more directly related to business practices and design.

5.1 Case 1: Designing knowledge tools for housing services

In Finland, and especially in the metropolitan area around the city of Helsinki, the real estate services market is very competitive. Operating in the area, Oikotie is Finland's leading real-estate web-based service provider, helping individuals to search for new housing solutions, both in rental and buying homes. In the current markets, there appears scarcity of quality housing, be it in apartments, townhouses or single-house offering, making the search for housing both time-consuming and difficult, and leading to unsatisfactory outcomes that are often related to the difficulty of searching the market efficiently. There was thus an identified need for better and more efficient tools through which information could be searched and shared in real time and at any time. Furthermore, one of the key challenges for efficient real estate transactions is to identify and classify the requirements, needs and wishes of the clients who are searching for new homes.

In order to improve their operational capabilities in a difficult and complex marketplace, Oikotie commissioned a project from an IDBM team. The international team was composed of a Mexican business communication student, a Korean design student, a Finnish usability engineering student, and a German student in user-oriented design. The objective of the team was to add value to the existing web service by generating new ideas and concepts that aimed to understand how to identify, classify and satisfy the different desires and needs of the home buyers or renters that actively search the market. The ideas and concepts developed during the project had the goal to satisfy customer needs and user scenarios for the next five to ten years.

In order to achieve the desired outcome, the IDBM team started off by defining the attributes and specific considerations that searches in the real-estate context had, through analyzing the user experience of the service. The value chain of the service was charted and critical decision and information entry points identified. The critical points represented the moments in which the consumer had extensive need for information as well as the entry-points through which consumers could express their needs. As part of the research, the team had to extensively explore the future trends in IT services and web applications. Additionally, a field research trip was done to Dublin to a conference on the theme of future web applications.

In the subsequent phase of the project the findings of the research phase were transformed into new, creative, and useful concepts that enabled the Oikotie users to enjoy and increase the efficiency of their search for a new home. Based on the initial approach adopted by the team, two sets of results were presented to the client company. The findings and recommendations of what was called "phase one" referred to the analysis of the experience a person went through in order to find a new home and how the a semantic shift from search to match was achieved.

Three substantial areas were established in relation to Oikotie's services that were denominated as early, direct, and late phase. The early phase included steps before the Oikotie experience, while the late phase includes steps after the same. The main efforts of the project focused on the direct phase, and three conceptual applications were identified that were seen to enhance the user experience.

The first concept was called "Incoming offers" and it took the shape of a desktop application. The second concept was "Expressing wishes" which was an application that allowed a visual way to search and receive information through a narrative. And the final concept presented was named "Learning from others"; this was a prototype of an intelligent service that changes the visual appearance and behaviour of the website depending on the user necessities. Overall the project made extensive use of design tools and methods from the usability domain, applied into a service design context.

5.2 Case 2: Designing caring environments for Asian passengers

Due to its favorable placement, Helsinki, the capital of Finland, is a natural hub for air traffic between Asia and northern Europe. Over the last decade or so, the airport had evolved into a major transit point for both European and Asian passengers. The strategic approach of the national carrier, Finnair, has been to invest in the Asian traffic, and the airport authority, Finnavia, supports this "Via Helsinki" promotion through development of their facilities and services. The competition is tough in the airline industry, and both Finnavia and Finnair are constantly examining possibilities to improve their business offering and services in order to keep ahead of the competition. While the airplanes and offered services, together with the communication and promotion material, are the key design intervention elements of the airline, the airport facility design, passenger flow and service offering are the central areas of concern for the management of the airport. Over the years, the authority has developed the Helsinki airport to become one of the leading airports in Europe, winning several awards.

However, even though the current airport facilities were state-of-the-art, both technically and in terms of visual and interior design, the authority had a specific concern about the rising number of passengers that are coming in from Asia for the first time: What is the first impression that they have of the airport and the Via Helsinki concept, and how could it be tailored to suit the needs to the rising number of new passengers? The benchmarks were serious, including the brand new airports that have been built in the last decade in cities such as Hong Kong, Beijing, Shanghai, and Seoul; all of which are to a very high standard both in terms of visual and spatial design, not to mention functionality and overall grand scale. What are the motives why the Asian travelers would specifically choose Helsinki as the hub on their next trip?

In order to accommodate the rising number of passengers travelling through the hub an extension of the airport was commissioned and became operational in 2009. While the authority had done their homework well in terms of the existing passengers, the knowledge of the preferences of the future customers was not fully developed. The construction plans had included traveler friendly designs such as multi-language signage and orientation as standard practice. But the plans were still somewhat open: What are the features that would be specifically attractive and memorable to new Asian customers? What about the special service offering? Which services would the Asians find useful and value adding? How would the airport differentiate itself from other high standard air hubs in Europe and elsewhere?

Towards the end of the construction period, Finnavia commissioned a group of IDBM students to study the preferences of the Asian travelers. A team was set up, composed of a Japanese design student, a Chinese business student, a British business student and a Finnish architectural student. Their research began with an analysis of the airport operations, passenger flow and experience, and the extension plans of the airport. They examined the service design and offering targeted towards the Asian passengers. The team also made a study trip abroad to benchmark the offering and services of six airports in Asia feeding passengers to Helsinki. Through mystery shopping, design probes, participatory observation and interviews of their co-passengers, the team built up an understanding of a portfolio of new opportunities to profile the service delivery of the Helsinki hub. Through close contact with the airport authority, these ideas were discussed in bi-weekly and monthly meetings, and a series of proposals for interventions were made to enhance the service delivery of the airport, particularly concerning the new extension of the airport catering for the Asian passengers. The proposals included ice-bars, relaxation areas, internet connections, power outlets, charging stations, self-photo kiosk, design goods outlet, food and beverage outlets, and tobacco and smoking venues with distinct flavor, to name a few.

The airport authority publicized the project widely, and implemented a range of proposals in the first six months after the opening of the new terminal. The use of a series of environmental design tools and business planning methods in the iterative, abductive development process gave way to experiment with various possible solutions before the final intervention was decided upon. The multidisciplinary and multicultural backgrounds of the team (together with their wide range of language abilities) significantly enabled collaborative work done both within the team and between the authority and the team, and made it possible to make sense of this development challenge of wicked nature.

5.3 Case 3: Designing win-win ICT partnerships²

Information and communication technology (ICT) plays an important role in the sustainable development of growing economies. As Finland has extensive expertise in this area, the sector is a natural choice for supporting an economy such as Vietnam to reach the target of being a middle-class country by the year 2020. The project developed new ways of designing small-scale but big impact business development projects, which create new linkages between actors and increases knowledge in the affected organizations.

The multidisciplinary and cross-cultural collaboration between Finnish and Vietnamese teams aided an ongoing innovation partnership programme between Finland and Vietnam. A student team from Aalto University collaborated in a pilot project with students from the Hanoi University of Technology and researched challenges and barriers of Finnish-Vietnamese collaboration in the ICT sector. The overall objective was to develop sustainable business practices in Vietnam. The student group's industry project was defined to meet the requirements of the Finnish and the Vietnamese stakeholders. The task for the team was to come up with a concept that would benefit all three parties. The preparatory work in Finland was done in the fall of 2009, and the group travelled to Hanoi in January 2010.

While the assignment was originally open ended, after a quick analysis ICT-outsourcing from Finland to Vietnam was chosen as the focus of the project. A growth oriented and emerging Finnish player in this field was identified and chosen to be the case company of the research. In the fall it was also agreed with the Hanoi University of Technology (HUT) that a group of four Vietnamese students would join the project, making the practical field-work more fluent. The Vietnamese students booked around fifteen interviews for the first week of the field study, interviewing actors in the ICT-outsourcing to identify the barriers and challenges of such projects between Finland to Vietnam. Neither tangible implications of these interviews nor the final deliverable of the project were decided at this phase to stress the open-ended approach. This was in order to enable creative thinking and outcomes based on the actual needs identified in the interviews.

Already during the first day of interviews, it became clear that all interviewees, be it university professors or IT-outsourcing professionals, were interested in advancing networking between relevant actors. After the second day of interviews, the group decided that they would organize a seminar on the last day of the stay in Hanoi, and started making practical arrangements.

During the second week, the interview material was analyzed and a seminar was planned. The group had identified three areas with challenges to competencies, sales and

² This short version of the case is based on a text by the team members Emma Storbacka, Lars Oehlandt, Mikko Kiiskilä, together with Mikko Koria, Aalto University.

collaboration. The seminar involved an open discussion where company representatives, students and professors discussed barriers in collaboration. The open schedule enabled the group to make quick decisions and arrange a seminar in only a few days, supported by a local institutional framework from the two participating universities and the Vietnamese Government.

The two teams collaborated tightly during the field trip; the Vietnamese team members had made the practical arrangements for the interviews, conducted in pairs of a Finnish and a Vietnamese team member. Based on the memos the students wrote from each interview, the value of working with cross-cultural teams became clear, as it allowed the teams to capture the knowledge in a more effective manner and to analyze it with more depth.

For the industry participants, this pilot project demonstrated the value of collaboration, linking together two industries from different countries, and identifying the obstacles of collaboration. Significant results were achieved by involving student teams from both countries in the context of innovative development projects.

For the Vietnamese companies involved in the research and attending the seminar, the main outcome was an improved knowledge level of the Finnish (and Nordic) business environment. The research in Vietnam clearly showed that corporate-university collaborations should be increased in the ICT sector, to better reflect the real needs of the industry upon the universities. The project provided valuable learning experiences for all participants on both the individual and group level.

6 Conclusions

This paper examined how design thinking and abductive approaches could be applied to design education. The paper reviewed the key elements of design thinking – “Practices”, “Cognitive Approaches” and “Mindset” –with the aim of providing a basic conceptual approach for learning design thinking in higher education. Furthermore, the paper reviewed three cases studies in master’s degree level education within the International Design Business Management program of the Aalto University, suggesting that educating future design professionals in collaborative work through extensive real-life business projects creates abilities that are needed in design thinking.

Through dissecting the latest thinking, the paper argued that high end educational activity forcibly needs to consider the abilities related to collaborative work and multidisciplinary as key issues. In the past fifteen years, IDBM program has educated managers for the global design intensive business field, using problem and practice based learning methods in academic year long industry projects and intensive coursework.

In the light of the successful projects reported in this paper, it seems evident that engaging students in cross-cultural teamwork through short-term innovative development projects can help stakeholder organizations to benefit from new and fresh ideas and thinking, and to gain new insights that help to build up novel, innovative practice. The key to success is a multi-way partnering between local and international universities, business enterprises and public sector stakeholders, not forgetting the unique and valuable insights that individuals involved gain from their involvement in many ways and on multiple levels. The collaborative work in the cases underpins design thinking. The careful design of the intervention and of the collaborative effort and its modelling was essential to the success of the projects.

The IDBM experience demonstrates that bringing different professionals together within an educational program creates success in collaborative work and multidisplinary (and thus potential to create innovation), already before future professionals enter the job market. This can significantly cut down the formative period of high-end professionals from the lengthy decade it traditionally takes. Graduates from IDBM already possess the basic systemic skills and design thinking abilities that are needed in highly ambiguous business settings when they enter the job market.

As firms look for new competitive edges in the global competition, design thinking, and design methods emerge as a significant opportunity to enhance the value that enterprises create. This implies that one has to manage cross-functional and sometimes also cross-cultural teams effectively, creating innovation and value creatively from new products, services and customer interfaces. Future effective multidisciplinary professionals (designers, engineers, and business) need to be introduced as early as possible to the mindsets of other future professionals, but only when they already have a professional profile and an internalized knowledge base. This implies that truly effective academic programs that aim to enable learning in multidisplinary, collaborative work and design thinking must operate in the postgraduate level (master's or even wide professional diplomas), as IDBM does. Programs of this nature tend to require significant investments in time, industrial relations and faculty, as much of the teaching is done in small groups, within very intensive and demanding contexts. That being said, programs like IDBM enable maintaining the leading innovation economies in the world, through creation of superb capabilities to manage highly ambiguous global initiatives. Without these abilities, societies would find it difficult to maintain their levels of social development and human well-being where they are.

7 References

- ALLEN, D.; YOUNG, M. From tour guide to teacher: deepening cross-cultural competence through international experience-based education. **Journal of Management Education**, v. 21, n. 2, p. 168-189, 1997.
- BANTEL, K. A. Strategic clarity in banking: role of top management-team demography. **Psychological Reports**, v. 73, n. 2, p. 1187-1201, 1993.
- BANTEL, K. A.; JACKSON, S. E. Top management and innovations in banking: does the demography of the top team make a difference? **Strategic Management Journal**, v. 10, p. 107-124, 1989. Special issue: Strategic Leaders and Leadership.
- BECKMAN, S. L.; BARRY, M. Innovation as a learning process: Embedding design thinking. **California Management Review**, v. 50, n. 1, p. 25-56, 2007.
- BOLAND, R. J.; COLLOPY, F. Design matters for management. In: ____ (Ed.). **Managing as designing**. Stanford: Stanford University Press, 2004. p. 3-18.
- BORJA DE MOZOTA, B. Strategic view of design in business. In: KARJALAINEN, T.; KORJA, M.; SALIMÄKI, M. (Ed.). **IDBM Papers**. Helsinki: Aalto, 2011. v. 1, p. 40-49.
- BOOTH SWEENEY, L.; STERMAN, J. D. Bathtub dynamics: initial results of a systems thinking inventory. **System Dynamics Review**, v. 16, n. 4, p. 249-286, 2000.
- BROWN, T. Design thinking. **Harvard Business Review**, v. 86, n. 6, p. 84-92, 2008.
- BROWN, T. **Change by design**. New York, NY: HarperCollins, 2009.
- BUCHANAN, R. Wicked problems in design thinking. **Design Issues**, v. 8, n. 2, p. 5-21, 1992.
- BUNDERSON, J. S.; SUTCLIFFE, K. M. Comparing alternative conceptualizations of functional diversity in management teams: process and performance effects. **Academy of Management Journal**, v. 45, n. 5, p. 875-893, 2002.
- CARR, S. D.; HALLIDAY, A.; KING, A. C.; LIEDTKA, J.; LOCKWOOD, T. The influence of design thinking in business: some preliminary observations. **Design Management Review**, v. 21, n. 3, p. 58-63, 2010.
- CLARK, K.; SMITH, R. Unleashing the power of design thinking. **Design Management Review**, v. 19, n. 3, p. 8-15, 2008.
- DAHLIN, K. B.; WEINGART, L. R.; HINDS, P. J. Team diversity and information use. **Academy of Management Journal**, v. 48, n. 6, p. 1107-1123, 2005.
- DEW, N. Abduction: a pre-condition for the intelligent design of strategy. **Journal of Business Strategy**, v. 28, n. 4, p. 38-45, 2007.
- DOUGLAS, M. A.; STRUTTON, D. Going "purple": can military jointness principles provide a key to more successful integration at the marketing-manufacturing interface? **Business Horizons**, v. 52, n. 3, p. 251-263, 2009.
- DREWS, C. Unleashing the full potential of design thinking as a business method. **Design Management Review**, v. 20, n. 3, p. 39-44, 2009.

- DUNNE, D.; MARTIN, R. Design thinking and how it will change management education: an interview and discussion. **Academy of Management Learning and Education**, v. 5, n. 4, p. 512-523, 2006.
- EDELSON D. C.; REISER B. J. Making authentic practice accessible to learners. Design challenges and strategies. In: SAWYER, Keith R. (Ed.). **The Cambridge handbook of the learning sciences**. Cambridge: Cambridge University Press, 2006. p. 335-354.
- FRASER, H. M. The practice of breakthrough strategies by design. **Journal of Business Strategy**, v. 28, n. 4, p. 66-74, 2007.
- FRASER, H. M. Designing business: new models for success. **Design Management Review**, v. 20, n. 2, p. 56-65, 2009.
- GLOPPEN, J. Perspectives on design leadership and design thinking and how they relate to European service industries. **Design Management Journal**, v. 4, n. 1, p. 33-47, 2009.
- HASSI, L.; LAAKSO, M. Making sense of design thinking. In: KARJALAINEN, T.; KORJA, M.; SALIMÄKI, M. (Ed.). **IDBM Papers**. Helsinki: Aalto, 2011. v. 1, p. 50-62.
- HOLLOWAY, M. How tangible is your strategy? How design thinking can turn your strategy into reality. **Journal of Business Strategy**, v. 30, n. 2, p. 50-56, 2009.
- JUNGINGER, S. Learning to design: giving purpose to heart, hand and mind. **Journal of Business Strategy**, v. 28, n. 4, p. 59-65, 2007.
- KAO, J. Tapping the world's innovation hot spots. **Harvard Business Review**, Mar. 2009.
- LAVE, J.; WENGER, E. **Situated learning**: legitimate peripheral participation. New York: Cambridge University Press, 1991.
- LAWSON, B. **How designers think**. The design process demystified. Oxford: Architectural Press, 1980.
- LOCKWOOD, T. Transition: how to become a more design-minded organization. **Design Management Review**, v. 20, n. 3, p. 29-37, 2009.
- LOCKWOOD, T. (Ed.). **Design thinking**. Integrating innovation, customer experience, and brand value. New York, NY: Allworth Press, 2010.
- MARTIN, R. **The design of business**. Boston: Harvard Business School Publishing, 2009.
- MANNIX, E.; NEALE, M. A. What differences make a difference? The promise and reality of diverse teams in organizations. **Psychological Science in the Public Interest**, v. 6, n. 2, p. 31-55, 2005.
- MINTZBERG, H. **Managers not MBA's**: a hard look at the soft practice of management development. Berrett-Koehler, 2004.
- NAVARRO, P. Business schools: a study in Failure. **BusinessWeek Online**, p. 8, April 23 2008.
- PORCINI, M. Your new design process is not enough – Hire design thinkers! **Design Management Review**, v. 20, n. 3, p. 6-8, 2009.
- ROBINSON, K. **Out of our minds**. Learning to be creative. West Sussex: Capstone, 2001.

RYLANDER, A. Design thinking as knowledge work: epistemological foundations and practical implications. **Design Management Journal**, v. 4, n. 1, p. 7-19, 2009.

SANDERSON, G. Universities and knowledge: an international perspective. **International Education**, v. 5, n. 2, p. 1-2, 2001.

SATO, S. Beyond good: great innovations through design. **Journal of Business Strategy**, v. 30, n. 2, p. 40-49, 2009.

SATO, S.; LUCENTE, S.; MEYER, D.; MRAZEK, D. Design thinking to make organization change and development more responsive. **Design Management Review**, v. 21, n. 2, p. 44-52, 2010.

SAWYER, K. A. Creative teaching: collaborative discussion as disciplined improvisation. **Educational Researcher**, v. 33, n. 2, p. 12-20, 2004.

SAWYER, R. K. Educating for innovation. **Thinking Skills and Creativity**, 1, p. 41-48, 2006.

SCARDAMALIA, M.; BEREITER, C. Schools as knowledge building organizations. In: KEATING, D.; HERTZMAN, C. (Ed.). **Today's children, tomorrow's society: the development health and wealth of nations**. New York: Guilford, 1999. p. 274-289.

SCHOEMAKER, P. J. H. The future challenges of business: rethinking management education. **California Management Review**, v. 50, n. 3, p. 119-139, 2008.

SCHÖN, D. **The reflective practitioner: how professionals think in action**. London: Basic Books Inc., 1983.

TIEN, C. J.; CHU, S.T.; LIN, Y. P. The strategic points of problem-based learning. In: POIKELA, E.; POIKELA, S. (Ed.). **PBL in context: bridging work and education**. Tampere: University Press, 2005. p. 117-134.

VON HIPPEL, E. Economies of product development by users: the impact of "sticky" local information. **Management Science**, v. 44, n. 5, p. 629-645, 1998.

WARD, A.; RUNCIE, E.; MORRIS, E. Embedding innovation: design thinking for small enterprises. **Journal of Business Strategy**, v. 30, n. 2, p. 78-84, 2009.

WEBBER, Ruth. Integrating work-based and academic learning in international and cross-cultural settings. **Journal of Education and Work**, v. 18, n. 4, p. 473-487, 2005.

WILLIAMS, R. J.; HOFFMAN, J. J.; LAMONT, B. T. Demography and diversity in organizations: a review of 40 years of research. In: STAW, B. M.; CUMMINGS, L. L. (Ed.). **Research in organizational behaviour**. Greenwich, CT: JAI Press, 1995. vol. 20, p. 77-140.

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