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INTRODUCING ENTREPENEURIAL DESIGN THINKING

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ABSTRACT

The objective of this contribution is to conceptually analyze the potentials of entrepreneurial design thinking as being a rather new method for entrepreneurship education. Based on a literature review of different design thinking concepts we carve out a generic design thinking model upon we conceptually build a new model that considers entrepreneurial thinking as a valuable characteristic. The results of our work show that the characteristics of entrepreneurial design thinking can enhance entrepreneurship education by supporting respective action fields of entrepreneurial learning. In addition we reveal that entrepreneurial design thinking offers beneficial guidelines for the design of entrepreneurship education programs.

Keywords: design thinking, entrepreneurial thinking, entrepreneurial design thinking, entrepreneurship education, teams

INTRODUCTION

According to *Romme* (2003), design can be understood as an ideal-typical mode of engaging in scientific research and as an alternative to a natural sciences- and a humanities-based mode. Especially, design science involves inquiry into systems that do not yet exist. It is based on contributing to the so-called "relevance gap" between theory and practice by finding out about if systems will work (epistemological notion of pragmatism), and it draws on "design causality" in order to produce scientific knowledge, which is actionable and also open to validation (Van Aken and Romme, 2009; Van Aken, 2004; Romme, 2003). Against this background, design thinking is the basic methodology in order to "build up" ideas as the outcome of creative processes. According to *Simon* (1969, 55), this process has seven stages (define, research, ideate, prototype, choose, implement and learn) which can occur simultaneously and can be passed through repeatedly. Similar stage models have been developed by institutions like the "Hasso Plattner Institute of Design at Stanford University" (dschool.stanford.edu) in Stanford, USA, or most recently the "School of Entrepreneurial Design Thinking – The ED-School" (www.ed-school.com) at the

University of Koblenz-Landau in Koblenz, Germany. Although design thinking becomes increasingly attractive for business management, it has not yet been sufficiently recognized and discussed in the context of entrepreneurship and especially not in the context of entrepreneurship education. Still, there seems to be a gap between the design focus on creativity and invention on the one side and the entrepreneurial innovation focus on the other side (Cruickshank, 2010). In the following, we intend to overcome this gap by introducing the notion and concept of entrepreneurial design thinking. The objective of this contribution is to conceptually analyze the potentials of entrepreneurial design thinking as being a rather new method for entrepreneurship education. The results of our work show that the characteristics of entrepreneurial design thinking can enhance entrepreneurship education. In addition we reveal that entrepreneurial design thinking offers beneficial guidelines for the design of entrepreneurship education programs.

Based on the body of knowledge concerning design science, design thinking and entrepreneurship, we define entrepreneurial design thinking as a team-diversity-based approach for treating user-centered problems as entrepreneurial opportunities within an iterative process supported by the use of creativity fostering tools and environments.

The research design of this contribution is mainly conceptual however we also implicitly integrate our first experiences with workshops that we conducted in entrepreneurial design thinking classes at the University of Koblenz-Landau (Denzin, 2006). In the following, we will discuss different models of design thinking and conceptually develop an understanding for the characteristics of entrepreneurial design thinking. Afterwards we will formulate a model of entrepreneurial design thinking, introduce its main characteristics and discuss the implications of this model for entrepreneurship education.

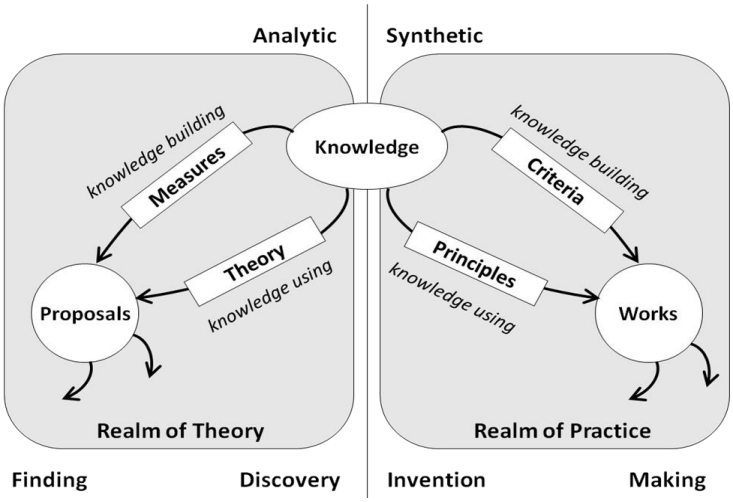
THEORETICAL BACKROUND

Design theory

The concept of design has a long tradition in organization theory as well as in management science, not least by virtue of the seminal work of *Herbert A. Simon* (1969). Thus it is not surprising that the field of design management evolved very successfully over the last decades in both disciplines (Cooper and Junginger, 2008). In very general terms, design is about the creation of meaning and describes both the results (systems, artifacts et cetera) and the development processes, which lead to the respective outputs (Kazmierczak, 2003). Design management conceptually links the potential benefits of creative design resources with business-oriented management decisions and the potential advantages of the use of management know-how with design processes and related outcomes (Best, 2006). Besides its business orientation, design management's contributions as a research discipline are rooted in what is called design research and design science.

In his work *Charles Owen* (1998) identified that design always consists of two phases: an analytical phase consisting of searching an understanding and a synthetic phase consisting of experimentation an invention (Figure 1).

Figure 1: Owens' model of knowledge generation in design theory (Owen, 1998)



Owen sees those phases in a framework that can describe the process of knowledge development trough design. He suggests that the design process has both analytic and synthetic elements, and that it operates in both the theoretical and practical realms. In the analytic phases of design, one focuses on finding and discovering, while in the synthetic phases of design, one focuses on invention and making. Movement between the theoretical and practical realms happens as participants in the process draw insights from what they have learned in the world of practice, convert it to abstract ideas or theories, and then translate those theories back into the realm of practice in the form of artifacts or institutions. He proposes that this is the elementary innovation process that fits all fields, although tools and techniques might differ in each field.

Design thinking theory

The range of understanding of design thinking is broad and diverse across several disciplines. These definitions cover generic descriptions like "approaching managerial problems as designers approach design problems" (Dunne and Martin, 2006, 512) to narrow down definitions of design thinking as "a distinctive process of mind which manifests itself in shape, configuration or composition of pattern or color containing performance (functionality), image (aesthetics, look, feel) and style (a manner of doing things, especially in a fashionable way) to produce a product, process, service, user experience, or an organic change" (Ilipinar et al., 2008, 6). As an effort to define design thinking by delimitation, *Liedka* (2004) compares science and design and infers that science uncovers actual conditions while design envisions options. *Romme* (2003) compares design with science and

with humanities as different research paradigms and connects the disciplines with the proposal of a design-science interface, and arranges a circular design within. Furthermore, the independence and membership of design thinking to disciplines throughout different sciences and arts is being discussed (Johansson and Woodilla, 2009). *Buchanan* (1992) even formulates a "doctrine of placements", describing design thinking as the systematic pattern of conceptual repositioning designs (including symbols, material objects, activities, organizations or complex systems).

The entrepreneurship-design-thinking nexus

Entrepreneurship and design thinking seem to be two disciplines, which are divided and thematically far away from each other. *O'Grady* (2008) even reveals a 'culture clash' between social sciences and design when he compares the different cultures of management and design students. Although there are interfaces between those disciplines, like in organizational design, there has always been the limitation of comparability due to different attitudes towards research: while design majoritarian excludes prediction as a modus operandi and embraces intuition and experiments, social sciences (including entrepreneurship) rely on prediction as their source of knowledge (Dunnbar and Starbuck, 2006). Even while design thinking is promoted as one of five future entrepreneurial minds (Duening, 2010) it is limited to the fields of "organizing" and "operating".

Despite this fundamental difference in researching approaches and allocations, design thinking and entrepreneurship seem to be a promising combination as a teaching approach in entrepreneurship education. Especially in the area of scientific entrepreneurship, design thinking can help to build sustainable concepts that are no more just technology-driven but also consider real-live-problems as impulses for development. In order to identify the possible benefits from this combination, we first need to unveil the nexus of entrepreneurship and design thinking. In literature, we can find examples that discuss similarities between those two disciplines. Following we will discuss the notion of entrepreneurs as designers (actor), the similarity in environmental condition, the similarity in the requirement of character and the role of creativity as a tool.

Similarity of actors: *Boland et al.* (2008) for example describe entrepreneurs as designing managers. In a similar approach, *Sarasvathy et al.* (2008) indicate that entrepreneurs and designers have similarities by unveiling the entrepreneurs' attributes as designers. In their work they point out that entrepreneurs are designers on two levels. First they design entrepreneurial artifacts, which can be new organizations, markets or institutions. Second their artifacts design their own environment. Furthermore in design thinking (Dunne & Martin 2006) as well as in entrepreneurship (Foo et al., 2005) the advantages of multidisciplinary teams are discussed. Both disciplines consider team-based approaches as central elements.

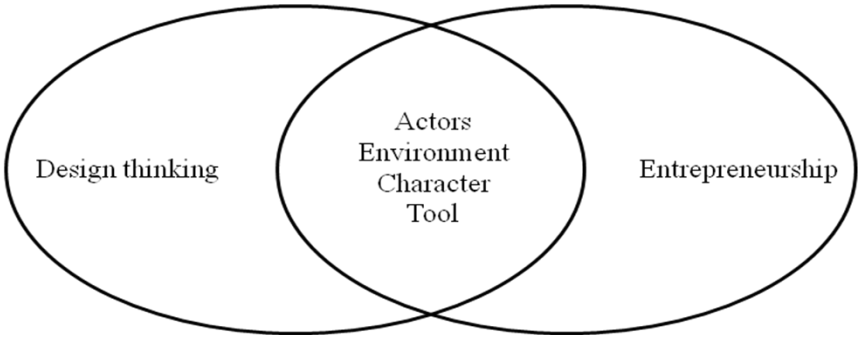
Similarity of environmental condition: Furthermore entrepreneurs deal with uncertainty that makes it impossible to calculate probabilities for future consequences

(Sarasvathy, 2004; Sarasvathy et al., 2008). This environmental condition is also identified in the context of design with the notion of "wicked problems" that designers face (Buchanan, 1992). In both disciplines uncertainty is a major force that drives behavior.

Similarity in character: In entrepreneurship as well as in design thinking there is a distinct need for empathy. Entrepreneurs use empathy in order to gauge the appropriateness of novel ideas (Chiles et al., 2010). It helps entrepreneurs to understand the problems (prospect) customers have. Designers use empathy in the same manner when they imagine the world from a user perspective, (Brown 2008) and understand (prospect) users' problems (Dunne and Martin, 2006). This attribute allows for entrepreneurs and designers to address explicit or latent needs. Especially the identification of latent needs enables the creation of new markets.

Similarity in creativity as a tool: Creativity is like empathy an important element in both disciplines. In design thinking creativity is the core of discussion in all works (Ping-Yong Lee, 2008). Li (2002) describes design as being the synthesis of creativity as the ability to imagine new thing and innovation as the ability to bring those new things together. In entrepreneurship creativity is required in order to identify opportunities that lead to new ventures (Ko and Butler, 2007). Matthews (2010) argues that creativity I the intersection between entrepreneurship and design. She first analyzes entrepreneurship, design and creativity as independent processes and concludes that creativity is the main similarity between entrepreneurship and design.

Figure 2: The entrepreneurship-design-thinking nexus



THE ESSENCE OF DESIGN THINKING

Design thinking was gradually derived from classical design domain into various disciplines (Lindberg et al., 2010). Different applications of design thinking accompany different process models and therefore we find variety of understandings of what design thinking is ought to be. For the formulation of entrepreneurial design thinking as a teaching method for entrepreneurship education, a solid definition of design thinking and its process

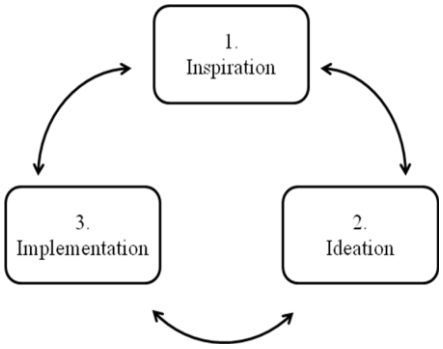
is needed. A review of different models and their interpretation will help to postulate a generic definition of design thinking and its process for the "entrepreneurial purpose". Doing this, we will be able to understand the basic principles of design thinking that sum up into a general understanding of design thinking. Therefore selected articles concerning "design thinking" will be analyzed on two levels - design thinking comprehension and process model.

Literature review

In an article published through Harvard Business Review, *Brown* (2008) introduces design thinking and expresses his comprehension by concentrating on the executers' characteristics of the design thinking process: the "Design Thinker". In his understanding a "Design Thinker" has to provide empathy towards people he works with, apply integrative thinking, exhibit optimism, advocate experimentalism and embrace collaboration. Design thinking is described as "…a discipline that uses the designer's sensibility and methods to match people's needs with what is technological feasible and what a viable business strategy can convert into customer value and market opportunity" (Brown, 2008, 2).

He declares the design thinking process as a system of three phases (inspiration, ideation and implementation), while he emphasizes the circular mode of the spaces and the possibility to loop backwards if needed (Figure 3). In Brown's concept, **inspiration** as the beginning of the design thinking process represents the recognition and understanding of a problem and opportunity. Subsequently in the space of **ideation** several ideas are generated, which provide possible solutions to the problem. The following space of **implementation** employs the idea execution and the learning from the process so far.

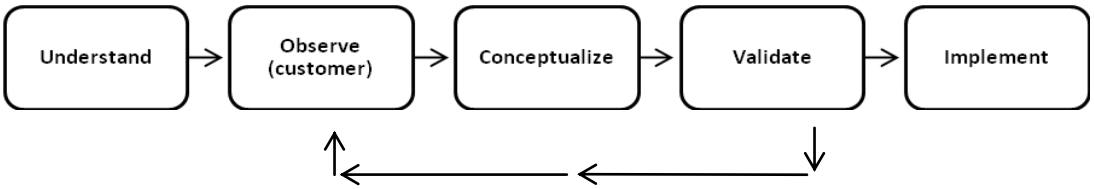
Figure 3: Design thinking spaces by Brown (2008)



Clark and Smith (2008) describe design thinking more as a tool that helps business executives to adopt design instincts and methods. They see design thinking as a universal problem-solving method that can be implied in every profession. In their understanding design thinking enhances three types of intelligence that are necessary for innovation: (1) emotional intelligence as the ability to work with empathy, (2) integral intelligence for being able to bring different ideas together and keeping the big idea in mind while working

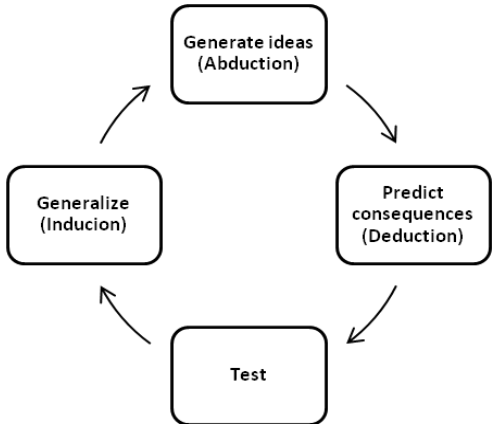
on details and (3) experimental intelligence as an experience learning method. The formulated design thinking process exhibits five steps (Figure 4), beginning at **understanding** the problem, continuing by understanding the customer through **observation**, **conceptualizing** a solution and **validating** it. The last step is the **implementation** of the solution. Between validation and observation of the customer there can be iterating loops.

Figure 4: The experience design method at IBM (Clark and Smith, 2008)



On an article written by *Dunne and Martin* (2006), design thinking is described as the mental process that designers use. Furthermore a certain attitude of curiosity, as well as a design attitude is needed, meaning the designers perception of problems' constraints. Furthermore they formulate the request for integrative thinking, which provides a holistic view by identifying important relationships and extending the notion on salient aspects. Iterative and collaborative work is recognized as essential for design thinking. Both kinds of work emphasize the role of constraints as triggers for creative solutions and the benefits of collaboration with diverse team members. Regarding the process of design thinking the authors formulate "The Cycle of Design Thinking" (Figure 5), which consists of four elements: **generalize**, **generate ideas**, **predict consequences** and **test**. This process model also exhibits a circular buildup, which benefits the work with difficult problems.

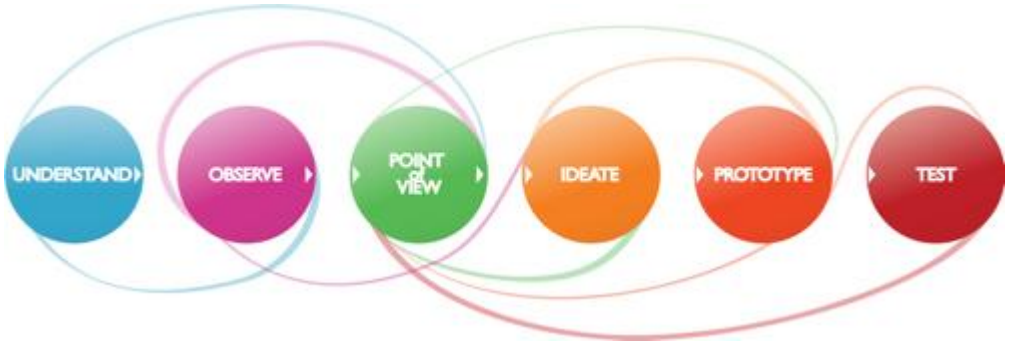
Figure 5: The Cycle of Design Thinking (Dunne and Martin, 2006)



Lindberg et al. (2010) introduce the design thinking process according to the approach of the Stanford d.school. They introduce their approach as a didactic process model that is used for design education (Figure 5). The main task of the model is to balance flexibility as well as sequentiality. Therefore the model is arranged in a linear manner but considers forward and backward linkages. In the phases of **understand** and **observe** the

analysis of problems is essentially important for the following process of problem solution and is neglected in a lot of approaches. Within this approach great value is set upon this phase of the problem solution and big space within the process is acknowledged to it. Thereby especially empathy, the ability to put oneself in the situation of other people and to "change the perspective" is emphasized. In the following phase of **point of view** gathered data is organized and insights are defined. In the phases of **ideate** and **prototype** creative solutions are ascertained and corresponding prototypes are produced. Especially brainstorming and modeling characterize these phases. In the last phase of **test** the prototypes are implemented and tested in real application. Corresponding modifications are made if there is any demand on correction.

Figure 6: The Design Thinking Process at Stanford's d.school (Plattner et al., 2009)



A generic design thinking model

Regarding the literature review we can identify certain characteristics that are mentioned throughout all the design thinking concepts. In the following we will describe those characteristics. Furthermore we will develop a design thinking process that considers the above introduced processes.

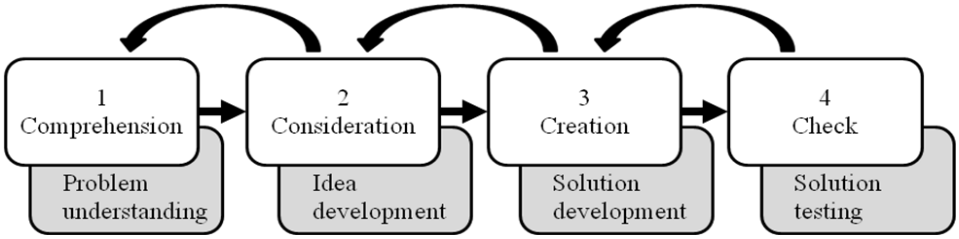
Iterative, stepwise process: Although the models discussed above provide different processes, all of them exhibit an iterating buildup of some sort, from several looping steps (Clark and Smith, 2008; Stanford, 2009) up to complete circular structures (Dunne and Martin, 2006). The concept of process is the central promoted element in design thinking. As shown above every finding in the literature exhibits a process consisting of several phases as the key element of design thinking. The understanding of process is essential for making design thinking teachable as well as tractable (Chan, 2008). Furthermore, a process in design thinking assures that problems are treated until they reach the status of solutions or solution suggestions. Thus, the design thinking process can be regarded as the fundament of design thinking. In literature, the distinct term "procedural design thinking" (Chan, 2006) emphasizes the importance of a "process aspect" in design thinking. The iterative, stepwise process is due to the "wicked" problems, design thinkers have to face (Buchanan, 1992). These problems are ill-formulated and characterized by provide confusing information and exhibit complex interdependencies. Therefore a linear technique would not be suited to

address problems of wicked nature (Rylander, 2008; Buchanan, 1992). These problems are considered design thinkers' challenges (Dunne and Martin, 2006). Apart from the amount and matter of the process steps, the tendency of implementing iteration is very clear. In addition, every design thinking process requires input (design problem) and produces output (solution or solution suggestions). The specification of input and output is depending on the particular scientific appliance of design thinking (e.g. management education). Furthermore the process of design thinking has to imply diverse elements, like activities, participants or guidelines. In summary we can formulate the standard that every design thinking process has to include iteration and stepwise processing in its structure.

Multidisciplinarity: The involvement of multidisciplinary teams in design thinking is promoted trough most of the literature (e.g. Dunne and Martin, 2006; Brown, 2008; Miosala and Toikka, 2008; Chan, 2008; Ungaretti et al., 2009). The source for this finding is the multidisciplinary affordance of the former introduced "wicked" problems. Designers have to face challenges that arouse questions in several disciplines and therefore have to import knowledge from different sciences - they "are accustomed to forming ad-hoc teams and collaborating for a specific purpose" (Dunne and Martin, 2006). Hence design thinking has to enable and demand multidisciplinary teamwork. Multidisciplinary teamwork as an element of design thinking becomes recognized by phrasing the term "collaborative design thinking" (Chan, 2008), giving this element an own space in design thinking theory.

The generic design thinking process is the result of our literature analysis (Figure 7). In the first phase of **comprehension** the main goal is to gain an understanding of a problem or problem situation. By observing behavior, simulating problem situations and interviewing customer orientation enables problem understanding. In the following phase of **consideration** ideas are developed based on the deeply understood problem. Techniques like brainstorming and creativity-fostering tools like playful environments support the development of ideas. Afterwards, the phase of **creation** is guided by prototyping of solutions. The design thinking process winds up in the phase of **check**, when a solution is brought to field-experiments and confrontation with prospect users. In each phase there can be one or more steps back to former phases in order to deepen or restart work if necessary.

Figure 7: The generic design thinking process



THE IMPORTANCE OF ENTREPRENEURIAL THINKING

It is recognized that entrepreneurial thinking is not something someone is born with, but that it can be acquired (Krueger, 2003, 133; Gartner, 1988, 63; Minniti and Bygrave,

2001, 7). An entrepreneur learns through factual knowledge, experience and the interpretation of experience (Davenport, De Long and Beers, 1998, 43). This learning process is non-linear and continuous. The ability to identify a business opportunity depends on an entrepreneurs acquired knowledge (Hayek, 1945, 521f and Grichnik, 2006, 1312) and ability to understand the problems of his customers (Shane, 2000, 452). Even more: the acquired knowledge enables an entrepreneur to interpret a situation as an opportunity (Shane, 2000, 452). Entrepreneurial thinkers exhibit a higher rate of alertness for opportunities (Kirzner, 1978, 35ff and 65ff; Kirzner, 1997, 71f) and intuition than other people (Allison, Chen and Hayes, 2000, 32). Entrepreneurial learning builds on experience as the main source for knowledge as entrepreneurs reflect on their own actions (Dalley and Hamilton, 2000, 55). New experiences are combined with existing knowledge in order to expand it (Minniti and Bygrave, 2001, 5ff). This is very similar to *Owen's* (1998) model of knowledge generation in design. Unexpected events cause a higher learning effect as they break routines (Jarvis, 1987, 167f). The importance of experience is proven in a study conducted by *Delmar and Shane* (2006, 240), where they proofed that new ventures where more successful if they were founded by more experienced entrepreneurs. Opportunity identification is an essential entrepreneurial characteristic that is valuable for new venture creation. In entrepreneurship education we need students to learn how to create question instead of finding answers (Krueger, 2007, 132).This quality helps entrepreneurial student to understand and interpret problem situations as entrepreneurial opportunities. Considering the design thinking process, opportunity identification should be the first step, before students try to understand a problem – they should find it first.

According to *Shane and Venkataraman* (2000) entrepreneurs (1) discover, (2) evaluate and (3) exploit opportunities. So far, we discussed the concept of discovering (opportunity identification) and evaluating (design thinking). The last step refers to the exploitation of entrepreneurial opportunities. In the context of entrepreneurship education we understand the creation of a business model and writing of a business plan as the beginning of opportunity exploitation. Regarding the opportunity identification and design thinking process we can summarize, that students have found a problem, interpreted it as an opportunity and created and tested creative solutions. The entrepreneurial component of opportunity exploitation should now be introduced towards the end of the creative phases and lead to the creation of a business model based on the developed problem solution.

INTRODUCING ENTREPRENEURIAL DESIGN THINKING

Characteristics of Entrepreneurial Design Thinking

In the following the characteristics of entrepreneurial design thinking will be introduced and discussed.

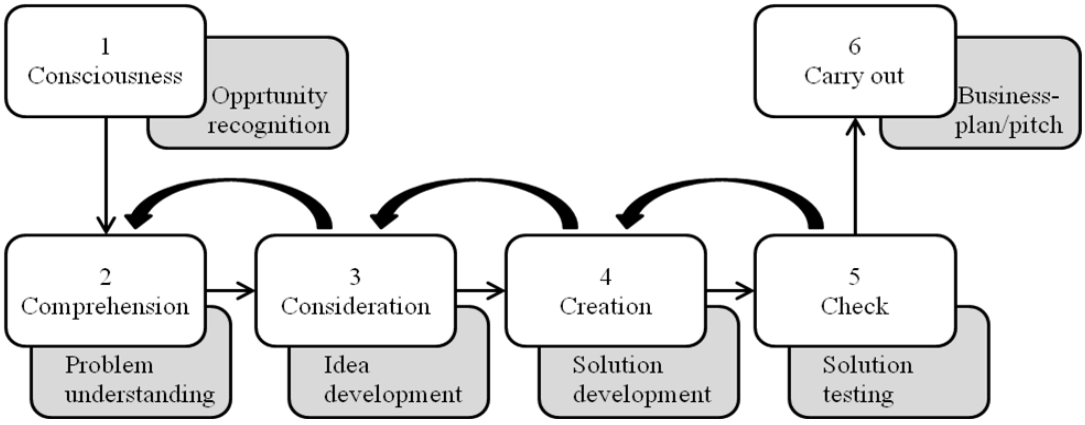
Process: By discussing entrepreneurial thinking we identified entrepreneurial alertness as the main trigger in order to find and interpret opportunities. Entrepreneurial alertness as a main characteristic of entrepreneurial thinking is a precondition. Therefore it needs to be the first step in entrepreneurial design thinking. Only if a student is capable to identify a problem situation of a customer as an opportunity the student can consider this as a starting point for problem-solving. The exploitation of an entrepreneurial opportunity was introduced as the last phase of a combination of design thinking and entrepreneurship. Entrepreneurial thinking puts design thinking in brackets (Figure 8) and results in a concept for entrepreneurial design thinking as the combination of entrepreneurial thinking and design thinking.

Figure 8: Concept of entrepreneurial design thinking

The first phase in entrepreneurial design thinking is the identification of an opportunity which we label “consciousness”. This marks the starting point for the next steps of comprehension, consideration, creation and check. The phase of opportunity exploitation is labeled “carry out” and aims towards the development of business models and writing of business plans. The understanding of the design management process is essential for making design thinking teachable as well as tractable - this attempt is derived from researchers’ effort to understand “how one designs” (Chan, 2008). Furthermore, a process in design thinking assures that problems are treated until they reach the status of solutions or solution suggestions. Entrepreneurs face problems that are difficult to estimate, offer little information and intransparent links. As we already discussed design thinking and entrepreneurship literature acknowledges this circumstance (Buchanan, 1992; Sarasvathy et al., 2008; Sarasvathy, 2004). Iterative procedures account for this problem situation: students can revisit former work steps with new information and redesign their solution. The iterative structure of entrepreneurial design thinking allows for setbacks and therefore fosters experimenting.

Put together, we can describe entrepreneurial design thinking as an entrepreneurship education approach for treating user-centered problems as entrepreneurial opportunities within an iterative process of solution creation and exploitation.

Figure 9: Process of entrepreneurial design thinking



Our entrepreneurship education approach

The purpose of entrepreneurship education is to impart entrepreneurship knowledge in students' minds (mindsets). In order to successfully teach entrepreneurship it is necessary for students to actually experience entrepreneurship (Young, 1997). The concepts of experimenting and experience-based learning are important for entrepreneurship education, as they enhance learning success (Kourilsky and Carlson, 1997). Therefore we try to account for experimenting and experience-based learning by using entrepreneurial design thinking a framework for our entrepreneurship courses.

The students work on different complex projects, whereas the intensity and the continuity increase over the course of time. First of all introductory projects are elaborated for teambuilding and becoming familiar to the methods. Afterwards the groups work on enhanced projects, whereas the teams rotate and thereby every group frequently gets new team members. At last every team works on a great final project that deals with the solution of a real problem that the team observed before and prepares a possible foundation of a business model. The activities of the students are aiming to an entrepreneurial execution of creative problem solutions. Thus, the participants get an education in creative teamwork processes as well as in entrepreneurship subjects. The latter subjects include a variety of topics for example business models, marketing and distribution or investment and financing. On the basis of this knowledge the participants are enabled to independently evaluate their ideas and to write a business plan. Thereby the members get entrepreneurial competences, which are not only important for their self-employment but also for an employment (intrapreneurship).

During the course, the students are accompanied by several advisers, who do not actively influence the process but give feedback and suggestions to indirectly instruct the participants. Ideally multiple advisers with different specializations are available to holistically accompany the students.

IMPLICATIONS FOR ENTREPRENEURSHIP EDUCATION RESEARCH AND PRACTICE

Building upon the principles of design thinking the University of Koblenz-Landau initiated the "School of Entrepreneurial Design Thinking" as a new approach to entrepreneurship education. Known concepts of design thinking become combined with entrepreneurship education characteristics like experience-based learning and business plan writing.

Entrepreneurial design thinking, as it was conceptually argued, is a very helpful methodology especially for entrepreneurship education. It may supplement the entrepreneurship research agenda on the levels of diverse teams, user-centricity, opportunities and processing. Further research needs to discuss these potentials on a broader empirical basis as well as in other contexts, like corporate or social entrepreneurship. Especially, our hypothesis is that entrepreneurial design thinking will increase the likelihood of successful start-ups from university origins. This also needs to be proved, empirically with respective rigor.

Entrepreneurial design thinking definitely offers an alternative scenario in order to impart entrepreneurial competences. It is the atmosphere and using building bricks and plasticize which makes this learning process playful. Also, it includes the possibility of self-evaluation of the measures provided during the entrepreneurial design thinking workshops because it is dynamic and flexible in itself.

Sound teams are the basis for successful start-ups. Most often, potential team members use well established contacts in order to build a team accrue from stable friendship-based relationships (Francis and Sandberg, 2000) or family connections. Without questioning the positive effects of trust-based close relationships, we like to recommend a more open perspective also here because we see a huge gap between what is used as contacts and what could be used. Entrepreneurial design thinking not only opens-up the perspective for other disciplines and related problem-solving perspectives but also for potentially completely new team members.

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