Visual Business Model Ideation

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Abstract

The objective of this thesis is to advance our understanding how the generation of novel business model ideas can be supported through visual idea generation methods in teams. This research is motivated by the dearth of existing research on the development of novel business models in existing firms, which ranks among the core challenges for management teams and remains a largely unpredictable endeavor. While different methods to foster business model innovation have been developed over time, little academic work has been done to systematically evaluate the requirements of this specific innovation task and the suggested methods. Two primary research gaps have been identified. The early phase of business model innovation is under-explored, and there is little understanding which methods may be beneficial to develop business model ideas. Four research questions are addressed in four distinct articles: (1) Which methods are suitable for generating business model ideas? (2) How do artifacts affect the dynamics of teams working on the development of sustainable new business model ideas? (3) How do idea generation methods differ with regard to their support for knowledge communication? (4) Do Design Thinking teams show different subjective and objective performance regarding outcome and process when working on different innovation tasks? This thesis relies on boundary objects theory and activity theory as the theoretical frames for the research project. By using a mixed methods approach, methods for the task of developing novel business model ideas are first identified in a literature review, then tested in an experimental setting, and finally one specific method is explored in case studies. This thesis provides several contributions to the field of business model innovation, idea generation, and visualization. First, it classifies idea generation methods suitable for the development of novel business model ideas and proposes six visual idea generation methods for further application and testing. Second, it indicates that the tension between the structure and flexibility of visual boundary objects inherent in two visual idea generation methods simultaneously supports and limits idea generation in teams. Third, the case studies indicate that even though Design Thinking is perceived as challenging by the teams, this perception does not impact the quality of the ideas negatively. Hence, this thesis provides support that Design Thinking is indeed suitable for the generation of novel business model ideas. These contributions have practical implications for managers regarding the development of business model ideas when resource constraints and the dominant logic of the current business model, among other factors, limit creativity and the ability to think outside the box.
Zusammenfassung

Chapter 1

Introduction

“Visualization and belief in a pattern of reality activates the creative power of realization.”

A. L. Linall, Jr.

Business models were once called “one of the great buzzwords of the internet boom” (Magretta, 2002, p. 86) as well as “perhaps the most discussed and least understood aspect of the web” (Rappa, 2000), where the creation of new business models, or business model innovation appeared, to take place and revolutionize the way of doing business in the 1990s. Since then, business model innovation has become a research topic for scholars interested in innovation (Chesbrough, 2006), entrepreneurship (Morris et al., 2005), strategy (Doz & Kosonen, 2010; Mitchell & Coles, 2004; Zott & Amit, 2008), and sustainability (Wüstenhagen & Boehnke, 2006; Yunus et al., 2010), among others. Researchers have provided definitions (Magretta, 2002; Morris, et al., 2005; Osterwalder et al., 2005) and classifications (Chatterjee, 2010; Rappa, 2000; Timmers, 1998), followed by literature reviews (Shafer et al., 2005), case studies (Bieger et al., 2002; Chesbrough & Rosenbloom, 2002; Meehan & Baschera, 2002) methods (Frankenberger et al., 2012), and theoretical contributions (Zott & Amit, 2010; Zott et al., 2011).

For practitioners, generating new business models remains one of today's most challenging tasks, often residing with top management (Chesbrough, 2006; Christensen & Overdorf, 2000). The need to change the established business model often arises in a serious crisis of the firm and its current business model (Johnson et al., 2008; Meehan & Baschera, 2002), as well as from the need to keep the company innovative and ahead of competitors (Mitchell & Bruckner Coles, 2003; Voelpel et al., 2004). Hence, the business model concept is first of all crucial for understanding firms’ complex innovation attempts, which are neither product nor service innovations but intend to change the way business is conducted. One well-known example is the business model innovation at Hilti, a manufacturer of power tools for construction professionals (Meehan & Baschera, 2002). Instead of selling tools to construction companies, Hilti now sells the service of always having functioning tools, at any time in the course of a construction project. While the Hilti case is presented as a successful business model innovation example, the employees at Hilti did not aim for a business model innovation when the new service was developed and introduced.

However, researchers and practitioners alike do not only seek an understanding of business model innovation ex-post, but require insights on how their business model
functions, which inefficiencies are threatening the business model, and how they can change their current business model pro-actively to create value.

In current research, business models are defined as activity systems (Zott & Amit, 2010) which are also referred to as templates “of how a firm conducts business” (Zott & Amit, 2010, p. 222). Business models are subject to change and are in constant interaction with other business models, which requires that even complex business models are made somehow visible, or tangible, to understand the current business model of a firm (Doganova & Eyquem-Renault, 2009; Osterwalder & Pigneur, 2010) and thereafter, through communication and ideation processes, novel business model ideas are developed. The development of novel business model ideas is the starting point for this dissertation project.

1.1. Research Gap

"Daring ideas are like chessmen moved forward; they may be beaten but they may start a winning game."

Johann Wolfgang von Goethe

Business model innovation has gained much attention in the last years (Amit & Zott, 2012; Casadesus-Masanell & Ricart 2010; Magretta, 2002; Rappa, 2000) and has been distinguished as separate innovation type when compared to product (Bartezzaghi et al., 1997; Piller & Walcher, 2006) and service innovation (Barras, 1990; Uehira & Kay, 2009). While continuing interest from practitioners is articulated (IBM, 2009), firms have shown limited capabilities to develop and introduce business model innovations. One reason for the lack of innovation is the lack of methodical support for business model innovation: “companies have many more processes, and a much stronger shared sense of how to innovate technology, than they do about how to innovate business models” (Chesbrough, 2010, p. 356). Research has begun to explore the issue in more depth, aiming to provide a better understanding of the business model innovation process in firms in order to provide frameworks and methods in support of business model innovation in firms (Bucherer et al., 2012, p. 183). In the last decade, several methods to develop novel business model ideas have been presented (Frankenberger et al., 2012; Osterwalder & Pigneur, 2010; Pateli & Giaglis, 2005; Peterovic et al., 2001). However, systematic assessments of what exactly is required for business model innovation, as well as the systematic tests of the methods, have been missing. This thesis fosters the understanding of how visual methods to
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develop business model innovations are an important aspect of the business model innovation process, therewith contributing to research on business model innovation, idea generation, and visualization in management.

This thesis relies on different sources of research to investigate the topic of business model idea generation, which is itself boundary spanning and thereby relies on different sources of knowledge (Chesbrough, 2006; Osterwalder et al., 2002; Pateli & Giaglis, 2004). Specifically, it builds on research from three different fields: business model innovation, idea generation, and business model visualization, always with a specific focus on team aspects. In the following section, each field is briefly introduced to motivate the research gap that this thesis intends to fill.

Recently, visualization of business models and their components has gained increasing scholarly attention (Chesbrough, 2010; Doganova & Eyquem-Renault, 2009; Osterwalder & Pigneur, 2010) and contributed further to the development and application of business model innovation methods. Research on business model visualizations and the creation of business model artifacts relies on boundary objects theory that suggests that visual representations of business model components acquire the properties of a boundary object in the innovation process (Doganova & Eyquem-Renault, 2009). While Doganova and Eyquem-Renault (2009) provide insights into how boundary objects, in the form of business model visualizations, facilitate communication and the adaption of an existing business model idea, research has so far not addressed how those visualizations enable the development of a new business model. Visualization research has provided insights in how knowledge creation and sharing is facilitated, for example through picture stimulation (Näykki & Järvelä, 2008; Stigliani, 2008), but also how visual tools may accentuate biases in decision making (Lurie & Manson, 2007). This research suggests that both benefits and risks are associated with visual ideation tools. Yet, nor business model innovation methods have been systematically tested yet, nor has the impact of specifically visual business model ideation methods been explored.

The thesis focuses on the analysis of collaborative team efforts to develop novel business model ideas. Research has posited that to develop a solution to a wicked and ill-defined problem statement such as business model innovation (Auer & Follack, 2002; Doz & Kosonen, 2010; Peterovic, et al., 2001), knowledge from different sources is required (Fay et al., 2006; Garfield et al., 2001). Enabling and pooling
“collective creativity” (Hargadon, 2002, p. 65) is nothing but the re-combination of the known to create something new, for which the joint development of visual artifacts (Ewenstein & Whyte, 2009; Henderson, 1991) is essential. For example, Sele (2012, p. 3) argues: “Novel artifacts and ideas take shape through translation processes, leading to the collectivization of local and dispersed meaning over time”, by quoting sociological research from Callon (1986) and Latour (2005). Hargadon (2002, p. 65) further argues “rather than relying on each individual’s past experiences and expertise, collective creativity represents social interactions as a shared thinking process that spurs the search for novel interpretations of problematic situations and for novel solutions.”

Research on idea generation has focused at great length on the differences and implications of individual and collective idea generation (Dennis & Valacich, 1994; Nagasundaram & Dennis, 1993; Paulus & Huei-Chuan, 2000; Valacich et al., 2006), as well as on the effectiveness of different idea generation methods (DeRosa et al., 2007; Heslin, 2009; Munemori & Nagasawa, 1996; Shah et al., 2000; Shah et al., 2003; Sutton & Hargadon, 1996). Idea generation has been analyzed for different tasks, such as generating new product ideas (Dahl & Moreau, 2002), new ideas in engineering (Shah, et al., 2003) or marketing ideas (Goldenberg et al., 1999). Most experiments that have been conducted to test idea generation methods rely on artificial tasks, such as the “school of business task,” as applied by Shepherd and colleagues (1995), which asks subjects to find a solution to crowded classrooms. Yet idea generation research has not yet considered the specific task of business model innovation and its methodical requirements.

In summary, this thesis builds on research on business model innovation, idea generation, and visualization, but existing literature in these fields’ does not explain which methods are suitable for developing novel business model ideas in firms. While existing research on business model innovation does not explain how business model ideas may be developed in firms, extant literature on idea generation methods introduces methods and applications but does not address which idea generation methods are most suitable for this complex and ill-defined task (Auer & Follack, 2002). In light of this research gap, this cumulative thesis aims at making three main contributions.
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First, the thesis aims at contributing to business model innovation literature by selecting and examining methods for the development of new business model ideas in existing firms. Second, the thesis seeks to contribute to idea generation literature by testing different idea generation methods for the specific task of business model innovation. Finally, the thesis contributes to visualization research by broadening understanding of how visual methods, which either provide visual templates or rely on the visual creation of ideas, facilitate idea generation for wicked and ill-defined tasks in incumbent firms (Auer & Follack, 2002; Doz & Kosonen, 2010; Peterovic, et al., 2001). Therewith, visualizations contribute to the boundary-spanning activities of a firm (Amit & Zott, 2001; Zott & Amit, 2008; 2010), required for business model innovation.

To understand how managers can actively foster business model innovation in firms, the research in this thesis project focuses on the very beginning of the innovation process: the generation of novel business model ideas. Based on this research interest four research questions are posed, which are addressed in four related but independent articles.

Chapter 2 analyzes research on the intersection between business model innovation and idea generation research to identify selection criteria and classification principles for idea generation methods suitable for business model ideation to answer the following research question:

Which methods are suitable for generating business model ideas in incumbent firms?

The articles in Chapter 3 and Chapter 4 provide a first assessment of two of the visual methods for the generation of novel business model ideas identified in Chapter 2 by comparing the methods against a control condition in an experimental setting. Chapter 3 focuses on the following research question:

How do artifacts affect the dynamics of teams working on the development of sustainable new business model ideas?

Chapter 4 addresses the following research question:
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How do idea generation methods differ in regard to their support for knowledge communication?

In order to understand how and if one of the selected method actually facilitates business model ideation compared to other innovation tasks, for which this methods has previously been used, Chapter 5 explored case studies with teams working on different tasks with the visual ideation method Design Thinking. In Chapter 5, the following research question is answered by analyzing case studies of Design Thinking teams working on product, service, and business model innovation tasks:

*Do Design Thinking teams show different subjective and objective performance regarding outcome and process when working on different innovation tasks?*

In the following, the structure of the thesis is introduced.

1.2. **Structure of the Thesis**

To examine how the very beginning of business model innovation, namely the generation of novel business model ideas, can be supported by different visual idea generation methods in teams, four research questions are posed and addressed in individual academic articles. This cumulative thesis consists of four distinct research articles that are concerned with the identification of suitable idea generation methods for the task of business model innovation (Chapter 2) by reviewing the literature on business model innovation and idea generation; the experimental application and comparison of two distinct visual idea generation methods (Chapter 3 and Chapter 4); and the examination of Design Thinking, a third method, in a data-rich exploratory case study (Chapter 5) that investigates the impact of this particularly complex method on both teamwork process and outcome. Therewith, Chapter 5 provides insights in if and how one of the identified visual ideation methods compares to other innovation tasks and if it can actually be applied to develop novel business model ideas.

This Chapter outlines the overall motivation and positioning of the research endeavor. It provides a general overview of the theoretical frames used in the research articles. Further, it contains the methodological premises of the four research articles. Therewith, Chapter 1 and Chapter 6 frame the four research articles by setting the
context and pointing out aspects that link the articles as well as drawing conclusions that reach beyond the individual articles. While all articles are linked by the common goal to understand which idea generation methods are especially suitable for the development of novel business model ideas in existing firms and are built on the same theoretical frames, the four articles in between use different research methods and focus on different aspects of the topic, thereby addressing different audiences. Hence, the articles provide stand-alone contributions to both research and practice.

Chapter 2 is a focused literature review that aims at reviewing a clearly delineated subset of literature at the intersection between business model innovation and idea generation research. Chapter 3 and Chapter 4 are deductive, hypothesis tests in nature, providing experimental evidence from the application of two specific methods. Chapter 5 instead is inductive and exploratory, aiming to provide contextualization in a team setting closer to real life, therewith increasing the external validity of the overall research results by reporting on a case study of one specific visual ideation method. Chapter 3 and Chapter 4 build for some parts on the same data set; therefore some limited text repetitions are inevitable, and yet provide different perspectives. Chapter 6 synthesizes the findings and contributions of the four articles. It provides insights into the theoretical and practical as well as methodological contributions and implications of the research project and concludes the thesis project.

The development status of the four articles differs. Chapter 2 has been submitted in a shortened version as a conference article to the Academy of Management 2013 in December 2012. Chapter 3 has been presented in different versions at the European Academy of Management Conference (EURAM), in 2011 and at the International Society for Professional Innovation Management (ISPIM), in 2011, it was nominated for the best paper award; it was published in a special issue of the International Journal of Innovation Management in 2011. Thus, the article has been revised multiple times in the process. Chapter 4 has been presented in two versions at the EURAM in 2012 and at the ISPIM in 2012 and has since been revised again and sent out for review for publication in a special issue of R&D Management. The most current version of the article is included in this thesis. Chapter 5 has been presented in different versions at the EURAM in 2012 and at the ISPIM in 2012 and has been

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1 All conference to which articles of this thesis have been accepted select contributions on the basis of a double-blind peer-review selection system and publishes accepted articles in proceedings.
submitted to a special issue of *Creativity and Innovation Management*. Again, the most current version is included in the thesis.

### 1.3 Theoretical and Conceptual Frames

In conducting this research endeavor, this thesis relies on two theoretical bases: Boundary objects theory and activity theory.

Boundary objects theory offers important insights for understanding how business models function in a firm (Doganova & Eyquem-Renault, 2009). The most commonly known and most widely applied business model ideation method is the Business Model Canvas (Osterwalder & Pigneur, 2010), which relies on visual representations of business model components to foster analysis, creativity and innovation. Research argues that visual representations of business model components acquire the properties of a boundary object in the innovation process (Doganova & Eyquem-Renault, 2009). Furthermore, objects are of much interest in different contexts, such as anthropological studies of work contexts (Star & Griesemer, 1989) and social studies of science and technology (Henderson, 1991). Practice-based theoretical work in the field of organizational studies has also led to a wider resurgence of interest in objects (Engeström & Blackler, 2005), which are central to both boundary objects theory and activity theory.

One central concept in activity theory are tools and objects that act as boundary objects by enabling and facilitating innovation activities, while boundary object theorists analyze the encounter between different social worlds, which is a “unit of analysis roughly equivalent to the activity system” (Engeström & Miettinen, 1999, p. 7). Developing business model ideas is the first, yet crucial, step of business model innovation. Business model ideation requires specific methods as well as an understanding of collaboration activities and needs within the setting of existing firms that aim to change the core of their daily business. In summary, business models are activity systems that may be changed with the support of boundary objects.

#### 1.3.1. Boundary Objects

This thesis derives theoretical guidance from boundary objects theory (Carlile, 2002; Star & Griesemer, 1989; Star & Griesemer, 1989) to understand how business models
can be changed. Boundary objects theory suggests that boundary objects support knowledge sharing and creation by functioning as bridging devices. Boundary objects may be the things of everyday life (Ewenstein & Whyte, 2005), sketches (Henderson, 1991), or various visual strategy tools, such as Porter’s Five Forces (Spee & Jarzabkowski, 2009), among others. Therewith, boundary objects are often visual representations that play an important role in both the content and process of collaboration (Black & Andersen, 2012). Black and Anderson (2012, p. 205) argue that it is the tangibility of boundary objects that stimulates a team’s ability “to get salient ideas ‘on the table.’” Boundary objects can be “fluid, open and dynamic; or as frozen, and hence unavailable for change.” (Whyte et al., 2007, p. 21). Based on research on the role of boundary objects in collaborative innovation activities (Fox, 2011) as well as in the development of new scientific and technological knowledge (Bechky, 2003a, 2003b), this research argues that boundary objects may facilitate business model idea generation. Boundary objects allow members of different groups to attribute different meanings particular to their needs to the same material. Nicolini and colleagues argue that those objects are “secondary objects of collaboration”, that is, they “facilitate work across different types of boundaries” (Nicolini et al., 2011, p. 14).

Furthermore, boundary objects facilitate the distribution of cognition through verbal and non-verbal means, for example through interactions with sketches and drawings (Lawson, 2006). It has long been recognized that boundary objects are involved in innovation activities. For instance, sketches and drawings (Carlile, 2002; Henderson, 1991; Star & Griesemer, 1989), as used in the development of architectural projects (Boland & Collopy, 2004) are boundary objects and thus enhance both the communication and creativity required to further develop any innovation activity. One central characteristic of boundary objects is that they are “both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star & Griesemer, 1989, p. 393). This tension between flexibility, or the need to change, and the unity of the current business model is present in business models (Doganova & Eyquem-Renault, 2009).

Doganova and Eyquem-Renault suggest that business models act as boundary objects because they are “moving around various actors and coordinating their action” (Doganova & Eyquem-Renault 2009, p. 1560). The first experiment article in this thesis investigates how boundary objects—in the form of artifacts, such as templates
and sketches—facilitate the generation of novel business model ideas by enhancing creativity and collaboration. We argue that the business model innovation canvas itself is a boundary object. Following the business model definition of Amit and Zott (2008), the business model (or structural template of an activity system) is embodied in a visual representation, such as the business model innovation canvas developed by Osterwalder and Pigneur (2010). Visual representations function as boundary objects and consequently enable transactions, such as knowledge exchange (Comi & Eppler, 2011), in the innovation team. Specifically, the business model innovation canvas (Osterwalder & Pigneur, 2010) uses visual representations of business model components to foster creativity. Hence, visual representations of business models and their components acquire the properties of a boundary object that mediates between the team members involved in the innovation process and enables boundary spanning transactions to change the old activity system.

1.3.2. Activity Theory

In this chapter, we argue that activity theory is a sound theoretical base to first define a business model and second offer an initial understanding of the phenomenon of business model innovation. In a recent study, Zott and Amit (2010) conceptualize a business model as an activity system, designed by the entrepreneur or manager. In their definition, Amit and Zott (2008, 2010) draw on activity theory. This theory has its roots in the cultural-historical school of Russian psychology of Vygotsky and colleagues that originally focused on child development and learning (Engeström & Miettinen, 1999). Traditional activity theory (Vygotsky, 1987) emphasizes that human development takes place through object-oriented action mediated by cultural tools and signs (Engeström & Miettinen, 1999, p. 4). In contemporary activity theory, as developed by Engeström (2003) and Blackler (1995), the socially distributed activity system is the unit of analysis, and the goal is to develop a unified account of knowing and doing in organizations (Blackler, 1995, p. 1035). Essential to organizational activity systems are “the relations between agents (…). Such relations are mediated by (…) the language and technologies used by participants within the system” (Blackler, 1995, pp. 1036-37).

The business model of a firm is an activity system, with relationships to the environment as well as to activity systems within the firm, which are, for example departments or teams. The business model may be changed by the manager when the need for change is recognized. The need for change arises when the activities are no
longer coherently linked. Change in one activity of the business model will affect other activities and, hence, may require adjustments in those activities (Amit & Zott, 2001, 2010; Zott & Amit, 2010). By defining business models as activity systems, or more specifically as structural templates (Zott & Amit, 2008, p. 5), a link is created to the assumptions of boundary objects theory. Specifically, it is argued that “objects provide the direction, motivation, and meaning for the activity” (Nicolini, et al., 2011, p. 9).

**Figure 1: A Complex Model of an Activity System (Engeström, 1999: 31).**

Hence, the design of the activity system is crucial for the success of the business venture: “An activity in a focal firm’s business model can be viewed as the engagement of human, physical, and/or capital resources of any party to the business model (the focal firm, end customers, vendors, etc.) to serve a specific purpose toward fulfillment of the overall objective” (Zott & Amit, 2010, p. 217). Within the activity system, the entrepreneurial manager who aims to change the business model of a firm (which may also be referred to as structural template (Zott & Amit, 2008)), sets the transactions. In other words, “An activity system is thus a set of interdependent organizational activities centered on a focal form, including those conducted by the focal firm, its partners, vendors, or customers, etc” (Zott and Amit, 2010, p. 217). For the design of activity systems, both design elements (content, structure and governance) and design themes (novelty, lock-in, complementarities, and efficiency) need to be considered (Amit & Zott, 2010, p. 217). The “activity system content refers to the selection of activities (i.e., transactions) that are performed” while the structure describes “how the activities (i.e., transactions) are linked” and the “activity system governance refers to who performs the activities (i.e., transactions)” (Zott and Amit, 2010, p. 120). Potential for innovation and change can be found in the design themes, which depict for example how new activities may be linked.

The definition of the business model as activity system is consistent with Osterwalder and Pigneur’s (2005, 2009) concept of a business model as the architecture of a firm that consists of nine individual building blocks. The Business Model Canvas by Osterwalder and Pigneur (2009) represents, as we argue, a visualization of the “structural template” that defines a business model according to Zott and Amit (2008, 2010).
1.4. Research Methods

For this thesis, a mixed methods approach (Bergman, 2008) with three complementary methods are selected in order to approach the complex phenomenon of business model ideation in existing firms and to answer the four research questions outlined previously. Thus, different methods contribute to the overall goal of this thesis project, which is to advance the understanding how the very beginning of business model innovation, i.e. the generation of novel business model ideas, can be supported by different visual idea generation methods in teams. The four studies have not been conducted at the same time. Rather, with the generation of more data, more research questions also emerged, which has resulted in different research articles.

Specifically, this thesis consists of a literature review, two experiments, and illustrative case studies. The literature review is applied as a research method to answer a research question, instead of the traditional use of a literature review to explore potential research questions. Hence, the literature review article in Chapter 2 provides an overview of the research field and the existing methods for business model ideation to identify methods from the idea generation literature, which, after testing, may prove suitable for business model ideation. The experiments in the articles in Chapter 3 and Chapter 4 allow for a focused assessment of the previously selected idea generation methods in a controlled environment. The Design Thinking case studies in Chapter 5 provides rich context for how this specific visual ideation method facilitates idea generation for different tasks, one being business model ideation. The output of Design Thinking teams is one and tested prototype, which is the best idea generated in the ideation process. Design Thinking has been identified in the literature review article as a potential business model ideation method, yet, so far been it has mostly been employed for product and service innovation tasks (Meinel & Leifer, 2011). To understand how innovation teams work with the same method on different tasks provides important contextual assessment for the understanding of how visual methods support business model ideation.

Hence, different idea generation methods call for different research methods for their assessment, as Design Thinking, for example, is simply too complex to be captured in an experiment, whereas ideation methods that do not require as much time for an initial idea generation, such as Collaborative Sketching and the Business Model Canvas, less time is required and contextual factors can be controlled for to gain a first
understanding of differences and similarities. The three selected methods are briefly outlined in the following sections.

1.4.1. Literature Review

As discussed below, the literature review in this thesis (Chapter 2) follows established practices, as it is systematic, follows a hierarchical search strategy, and is guided by a specific research question. The goal of the article is to identify which methods are potentially suitable for business model idea generation. Therefore, the literature review combines two literature streams. The first literature stream covers the field of business model innovation, and the second literature stream addresses idea generation methods for wicked, ill-defined problem solving.

A systematic review of past literature is a crucial endeavor for any academic research (Webster & Watson, 2002, pp. 48–49). To conduct a systematic literature review, Denyer and Tranfield (2008) suggest that researchers formulate a specific research question and define criteria for inclusion and exclusion of papers clearly at the outset. Tranfield and colleagues (2003) recommend collecting literature in a transparent manner and following a reproducible review procedure. According to Rudolph (2009), who bases his suggestions on the work of Cooper (1984), a literature review should include five steps: problem formulation, data collection, data evaluation, analysis and interpretation, and public presentation. Macpherson and Jones (2010) suggest useful principles for a state-of-the-art literature review. First, the review should be based on a field or sub-field that is mature enough to warrant a literature review with clearly defined boundaries of the review area. Second, the review should include a synthesis and evaluation of the accumulated state of knowledge in that field and consider how research has developed into sub-categories. Thereby, the literature review provides a thorough discussion of the status quo of a body of literature.

Third, the review should close with a clear statement of what contribution the review makes to theory and/ or practice (Macpherson & Jones, 2010). Hence, the relevance of a good literature review is high for both researchers and practitioners, as “evidence produced from a systematic review has the ability to have a real impact when experienced practicing managers, policy-makers, or researchers use such findings to

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2 Rousseau et al. (2008) provide the distinction between a traditional literature review and a systematic synthesis of research. Traditional literature reviews, they note, often focus on a number of key or primary papers around which secondary studies are integrated to provide a summary of a particular concept, theory or subject.
inform the judgments that they make in their day-to-day work” (Denyer & Tranfield, 2008; Macpherson & Jones, 2010, p. 110). Following these principles and suggestions, the literature review (Chapter 2) in this thesis is systematic, follows a hierarchical search strategy, and is guided by a specific research question.

1.4.2. Experiment

The data for the two articles in Chapter 3 and Chapter 4 are generated in experimental research. The experiments are carried out with test methods for the generation of business model ideas in existing firms.

Experiments follow a hypotheses-testing research design. In this research, the developed hypotheses pose that different visual methods have different effects on the group process of business model ideation (In Chapter 3 and 4). The three basic principles of experimental design are randomization, replication, and blocking of contextual factors (Dean & Voss, 1999; Montgomery, 2005), which have been established for all experiments conducted for the articles in Chapters 3–4. Randomization refers to the random assignment of subjects to treatment groups and ensures the external validity of the experiment by preventing a selection bias (Shadish et al., 2002). Replication and blocking are used to reduce or eliminate variability from nuisance factors (Montgomery, 2005). Furthermore, the assignments both to treatment and control groups have been equivalent, as suggested in the respective literature (Fraenkel & Wallen, 2005). A basic randomized experiment has at least two conditions: one experimental and one comparison or control (Schutt, 1996). The experiments conducted for this thesis have at least two experimental conditions, or visual idea generation methods and one control condition, which was always the idea generation method Brainstorming. Adding a pre-test to the basic randomized design as well as post-test assessment of units is also highly recommended (Shadish, et al., 2002).

1.4.3. Case Study

While experiments allow for the analysis of very specific and thus isolated issues, case studies allow for the analysis of the rich context. The last article of this thesis project in Chapter 5 employs an exploratory case study design to study idea generation over the course of a 10-month design thinking class at a Swiss University. To understand how a method differs when applied to different tasks, something that has not been
tested in the experiments conducted in Chapter 3 and Chapter 4, this case study research focuses on team dynamics in the process when the same method is applied for different tasks, and then how the results rated by industry experts compare to the team dynamics, which is a more realistic setting for innovation projects in firms.

For the design of case studies, Yin (2003) recommends three types: exploratory, explanatory, and descriptive. Each of the three approaches can be either single or multiple-case studies, whereby the multiple case study design allows for higher validity based on the comparison of different cases, as opposed to the analysis of extreme or unique single cases (Yin, 2003).

Explanatory cases are suitable for causal studies. In very complex and multivariate cases, the analysis can make use of pattern-matching techniques. Descriptive cases require that the investigator either begins with a descriptive theory, or develops a descriptive theory from the case. In exploratory case studies, fieldwork, and data collection may be undertaken prior to definition of the research questions and hypotheses (Yin, 2003), which is the case study method that has been applied in the article presented in Chapter 5. The main goal of the design thinking course is to teach students the design thinking method. To learn the method by applying it in a project cycle, the teams receive an innovation task from a partner firm. The innovation tasks are different for every team (service, product, or business model innovation); however, the design thinking process and the idea generation methods used as well as the number of participants in each team are exactly the same.

Case study research should always strive to simultaneously minimize and maximize variance. While some factors need to be kept constant to allow for comparisons, other factors need to vary to discern the impact of these factors (Kühl, 2009). In the three case studies, this research follows this strategy by keeping the Design Thinking method and the team size constant, while the task differs from team to team.

The Design Thinking process has not yet been systematically tested for its application to different ideation tasks, such as business model innovation. To gain first insights, a rich context is required to understand which impact the different phases and the different visual ideation methods have. Eisenhardt and Graebner (2007, p. 25) follow Yin (2003) and argue that case studies are comparable to “a series of related laboratory experiments, multiple cases are discrete experiments that serve as replications, contrasts, and extensions to the emerging theory. But while laboratory experiments
isolate the phenomena from their context, case studies emphasize the rich, real-world context in which the phenomena occur.”

A criticism of the case study method is that its dependence on a single case renders it incapable of providing a generalizable conclusion (Tellis, 1997). However, Yin (2003) argues that the relative size of the sample—be it 2, 10, or 100 cases—does not transform a multiple case into a macroscopic study. Chapter 5 reports a multiple case study design, which offers more generalizable conclusions. Another often stated critique of case study designs is, according to Tellis (1997), potential investigator subjectivity, which may threaten the construct validity of the case study research. Yin (2003) proposes three remedies: using multiple sources of evidence, establishing a chain of evidence, and having a draft case study report reviewed by key informants. The case study research in Chapter 5 relies on multiple sources of data, such as questionnaires, interviews, and prototypes, all of which have been recognized as valid sources of evidence by Yin (2003) and Stake (1995).

1.5. References


Chapter 1


Chesbrough, H., & Rosenbloom, R. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's


Chapter 1


Chapter 1


Chapter 1


Chapter 1


Finding Ideas When Needed the Most:  
An Evaluation of Idea Generation Methods for Business Model Innovation

Friederike Hoffmann

Abstract

To succeed at business model innovation, managers need systematic methods to generate novel business model ideas that constitute the very starting point of business model innovation. Business model innovation poses a wicked, ill-defined problem to incumbent firms, using the terminology of Rittel and Webber (1973). So far, research on business model innovation has not systematically addressed the question of which idea generation methods are suitable for the specific task of business model innovation. To identify selection criteria and idea generation methods, this article conducts a hierarchical literature review to combine two literature streams: business model innovation and idea generation literature. The article extracts criteria to use to build a framework for the identification of methods that are suitable for generating novel business model ideas. First, based on business model literature, this article synthesizes a list of three requirements for idea generation methods in the context of business model innovation: knowledge and understanding of the problem, creativity, and visualization. Second, the article systematically screens business model literature for methods to support the generation of novel business model ideas and identifies 9 methods. Third, the article turns to idea generation literature to identify additional methods that are potentially suitable for generating novel business model ideas. Since idea generation for business model innovation is a particularly complex task, the literature review focuses on idea generation methods that are suitable for such tasks. In idea generation literature, an additional 12 methods are identified. Fourth, the paper analyzes whether the total of 21 identified methods satisfy all three requirements. This analysis finds that only six methods—Business Model Canvas, Blue Ocean, Batelle-Bildmappen-Brainwriting, Collaborative Sketching, Design Thinking, and Visual Synectics—satisfy all three requirements. The paper concludes by providing directions for further research on these six methods in the context of business model innovation.

This article is presented at the EURAM 2013 conference in Istanbul, Turkey.
Chapter 2

2.1 Business Model Innovation as a Context for Idea Generation

It is widely accepted in innovation research that new ideas fuel the innovation process (Brem & Voigt, 2007; Christensen & Rigby, 2002). Hence, developing novel business model ideas is an important starting point for business model innovation (Eppler et al., 2011; Frankenberger et al., 2012). The generation of business model ideas is, however, an especially complex and difficult task for incumbent firms and differs significantly from well-researched product or service innovation tasks (Vetterli et al., 2012). More recently, business model innovation research focused on barriers to business model innovation (Chesbrough, 2010), business model innovation processes (Bucherer et al., 2012; Casadesus-Masanell & Ricart 2010; 2011), and the generation of business model ideas (Eppler et al., 2011; Frankenberger et al., 2012; Osterwalder & Pigneur, 2010).

The need for business model innovation in incumbent firms often arises out of a major disruption or serious crisis of the firm and its current business model that threatens its survival in a changing market (Chesbrough, 2006; Johnson et al., 2008; Meehan & Baschera, 2002). To develop a new, innovative business model, it is usually helpful to develop many different ideas (Garfield et al., 2001). From this pool of business model ideas, the most promising ideas can then be selected, recombined, and refined until the selected ideas are ready for a first, experimental implementation (Chesbrough, 2010; Mitchell & Bruckner Coles, 2004). However, existing literature presents methods for generating novel business model ideas in a rather unsystematic fashion and has yet to provide sufficient tests of which methods are best suited to this task. In light of this research gap, this paper is dedicated to answering the following research question: Which methods are suitable for generating business model ideas in incumbent firms?

To answer this research question, the article first identifies idea generation methods through a systematic search and review of two literature streams: business model innovation and idea generation research. Thereby, the article addresses the specific requirements for business model innovation in the idea generation phase and reviews the identified methods against these criteria. The focus of the literature review is on methods for the very beginning of business model innovation: the generation of new business model ideas. Two streams of literature are considered and combined.

First, research on business model innovation has highlighted the particularities of this specific innovation activity and has started to search for suitable idea generation meth-
Chapter 2

ods (Eppler, et al., 2011; Frankenberger, et al., 2012). Kamoun (2008, p. 639) highlights the importance of generating novel business model ideas for researchers: “the identification of new business models and the adaptation of existing ones in response to new innovations is an intricate task in technology management research”. While a couple of business model innovation methods have been identified in previous research (Osterwalder & Pigneur, 2010; Peterovic et al., 2001), challenges and barriers to business model innovation have also received ample attention in business model innovation research (Chesbrough, 2010; Eppler & Hoffmann, 2011). There is also little assessment on idea generation methods for business model innovation, with the notable exceptions of the introduction of the Business Model Canvas (Osterwalder & Pigneur, 2010). However, on balance, business model innovation research has not yet systematically examined the suitability of different idea generation methods to develop novel business model ideas.

Second, idea generation research has a longstanding tradition that has resulted in an extensive body of literature on idea generation methods (Heslin, 2009; Shah, 1998; Sowrey, 1990) and mechanisms (Amabile et al., 1996; De Bono, 1970; Nijstad & Stroebe, 2006). Numerous idea generation methods have been evaluated empirically in different settings, or types of ideas, such as product innovation, problem solving, or advertising and marketing (Börjesson et al., 2006; Flint, 2002; Goldenberg et al., 1999; Sutton & Hargadon, 1996). This research stream, however, has not been linked to business model idea generation. Whereas the mere application of the idea generation literature to generating business model ideas is not much more than a new application context, the characteristics of business model innovation are rather specific and thus call for methods that consider the requirements. Business models are per se particularly complex, and the task to generate novel business model ideas constitutes a wicked problem as defined by Rittel and Webber (1973) with the core of the firm about to be changed and the survival of the firm is at stake (Chesbrough, 2010; McGrath, 2010; Shi & Manning, 2009). In order to develop new business model ideas when complexity is overwhelming and creativity is low, it is necessary to identify which methods are applicable and most suitable to business model innovation. By combining the two fields, it is possible to gain knowledge on how idea generation works in a novel context and add to the existing body of literature. In sum, business model idea generation has not yet been examined systematically within either of these two literature streams. Idea generation research specifically does not offer any guidance for researchers or for managers about how to select suitable idea generation methods. Given the importance
of business model innovation for incumbents, this is a research gap of much academic interest and high practical relevance.

This article is structured as follows. First, the research method is introduced. Then, a systematic review of the business model innovation literature synthesizes a set of requirements for the selection of idea generation methods and identifies recommended methods in the business model innovation literature. Third, the idea generation literature is reviewed with the aim to identify classification principles that support the clustering of the methods from the field. A “long list” of idea generation methods that are potentially suitable for generating novel business model ideas is generated. The list is clustered based on the most suitable classification identified, and the most suitable idea generation methods are highlighted. The idea generation methods identified in business model literature and the methods identified in idea generation research are then matched with the criteria identified in business model literature. Finally, the article concludes by suggesting a first selection of idea generation methods and discussing the implications for further research.

2.2. Review Methodology

A comprehensive hierarchical search strategy has been adopted to identify the relevant business model and idea generation literature for the review. The literature included in the review was identified in a five-step process, which is shown in Figure 1. In the following section, the search strategy is described for business model innovation literature; it is similar for idea generation literature.

![Figure 1: Literature Review Process](image)

First, all articles listed in the ISI Web of Knowledge database published by Thompson Reuters containing the keywords “business model innovation” and “method,” “tool,” as well as “idea generation” and “innovation,” “business model,” and “business model innovation” in the title, abstract, and keywords have been identified. The search for the plural of each word did not result in new search results. The initial search resulted

1 The ISI search was conducted July 13–20, 2010.
Chapter 2

in a combined list of 1396 publications. After generating the initial list of publications, the options offered by ISI Web of Knowledge have been used to refine the list. English publications (“language”) from the fields of management, social sciences, education, and psychology (“subject areas”) that are labeled as “articles, reviews and editorials” (“document types”) have been included to ensure the quality of the contributions. In total, 384 articles have been identified. After reading through the abstracts of all articles identified, those not directly concerned with methods and approaches to idea generation have been excluded. For business model innovation literature, those articles that do not focus on a specific innovation approach have been excluded, which leaves 10 articles. In total, 117 articles have been included in the literature review.

Second, Google Search and Google Scholar have been used to further search for more articles and books that are relevant to the subject issue. Four colleagues offered additional literature on the topic. This search generated 10 additional articles and two books. Third, an additional literature search for the specific idea generation approaches identified in the first review of the literature has been conducted again using ISI Web of Knowledge, which generated 4 additional articles. Fourth, articles have been added during the process of analyzing the identified literature on an ongoing basis to ensure new related articles would not be missed. Articles on creative problem-solving techniques, which focused especially on idea generation, appeared to be particularly relevant. An additional 10 articles have been added up to the point this article was handed in for revision.

Finally, as the search for business model innovation methods generated a meager 10 articles, the next step was searching the full text of the most important business model innovation articles, which generated a total of 35 articles. With the practitioner literature gaining ground in managerial practice, and based on the highly practical relevance of the research topic, four additional books and articles have been included from practice oriented literature, such as Harvard Business Review. After a first review of all 180 articles and books, all articles that do not explicitly deal with idea generation methods have been removed, such as articles that focused on the methodology in the design of GDSS idea generation tools, as well as articles that are short conference proceedings.

2 The search for all searches related to idea generation resulted in 1197 publications; the search for business model innovation methods and tools resulted in 384 publications.
Based on the visualization used by Eppler and Mengis (2004) and Chen and Yu (2000), this literature review identified a set of articles and books that can be used to generate selection criteria and therewith potentially suitable idea generation methods, as depicted in Figure 2.

**Figure 2: Literature Review Approach**

### 2.3. Business Model Innovation Research

Business model and business model innovation research may appear vast and at the same time focused on particularities. Literature reviews on business model innovation mostly focus on *definitions* (Amit & Zott, 2001; Hamel, 2000; Magretta, 2002; Timmers, 1998; Weill & Vitale, 2001), individual business model *components* or “building blocks” (Afuah & Tucci, 2000; Chesbrough & Rosenbloom, 2002; Linder & Cantrell, 2000; Morris et al., 2005; Peterovic, et al., 2001; Tapscott et al., 2000), as well as distinct business model *types* in certain industries (Rappa, 2004; Stewart & Qin, 2000; Timmers, 1998). Specific efforts are being put into categorizing different business model types (Chatterjee, 2010) as well as establishing detailed analyses of business model components (Osterwalder & Pigneur, 2010; Osterwalder, Pigneur, & Tucci, 2005). While some research is conducted on developing innovative business
models for new ventures (Morris et al., 2005), other researchers focus on business models in different industries such as e-business (Hoegg et al., 2006; Rappa, 2004) or the airline industry (Bieger et al., 2002). An earlier research stream, mostly focused on e-business models, has suggested that there are a limited number of business models, which makes the most important task to choose the “right” business model among the options available: “to formulate and execute the right business models in the face of a technological change, with the most important task being to choose the right business model” (Afuah & Tucci, 2000, p. 78).

Scholars generally regard business model innovation as an entrepreneurial phenomenon, where the firm redesigns its business model in pursuit of competitive advantage and wealth creation (Ireland et al., 2003; Kuratko & Audretsch, 2009; Zott & Amit, 2010). Recent research proposes that business model innovation leads to reduced costs (Chesbrough, 2010; Chesbrough & Schwartz, 2007), revenue growth (Johnson et al., 2008), operating margin growth (IBM, 2006), and new markets with new customers for the incumbent firm (Chesbrough & Schwartz, 2007; Johnson et al., 2008; Markides, 2006). Business model innovation enables the firm to respond to disruptive innovations (Markides, 2006) and strategic discontinuities (Doz & Kosonen, 2010) and fosters the creation of value: customer core value and a value network configuration for value creation (Voelpel et al., 2005), such that “the business model concept is generally understood as a view of the firm's logic for creating and commercializing value” (Osterwalder et al., 2005). The advantages of new business models are multiple, as “new business models, or refinements to existing ones, […] often result in lower cost or increased value to the consumer; if not easily replicated by competitors, they can provide an opportunity to generate higher returns to the pioneer, at least until their novel features are copied.” (Teece, 2010, p. 182). However, so far “there has been very limited research on how business models evolve” (Wirtz et al., 2010, p. 274). Specifically, very limited research exists on how managers can deliberately foster the development and implementation of new business models. Yet this question is of obvious and high relevance to managers. Hence, it is necessary to gain a better understanding of how business model ideas may be generated in incumbent firms and to assess methods to tackle the “arduous and problematic task” of business model innovation (Giaglis et al., 2001, p. 5) by actively aiming to design novel business models (Teece, 2010).

Business model innovation is a complex or “wicked” task for incumbent firms that is especially difficult to solve (Auer & Follack, 2002; Doz & Kosonen, 2010; Hoffmann
et al., 2012; Peterovic et al., 2001). Wicked tasks, which are also referred to as “problems,” have been first described in design research by Rittel and Webber (1973). Ever since, the term has been applied to frame not only design (thinking) problems (Riel & Martin, 2012), but strategy (Camillus, 2008). Wicked tasks are neither easily understood and defined, nor is the generation of possible solutions an easily structured task. Rittel and Webber (1973) define ten distinguishing properties of wicked tasks. For example, there is no definite formulation of a wicked problem, solutions to wicked problems are not true or false but good or bad, there is no immediate or ultimate test of a solution to a wicked task, every wicked task is essentially unique, and every wicked task can be considered a symptom of another problem. Furthermore, both the task and the understanding of the task may evolve during the idea generation, and it is likely that “simultaneously understanding the problem and formulating a solution” is necessary (Conklin, 2005, p. 8). In this article, the task of business model innovation is considered an ill-defined, wicked task that allows systematic searching for ways to address this problem statement. By establishing business model innovation as a wicked and ill-defined task, it becomes apparent that traditional problem solving approaches are unlikely to provide appropriate solutions to the task of developing novel business model ideas. Therefore, the combination of insights from research on idea generation methods for complex problem statements with knowledge generated on business model innovation requirements and methods is especially promising to identify suitable methods.

2.3.1. Business Model Innovation Requirements

Understanding the specific requirements for developing novel business model ideas is an important prerequisite to identify and select potentially suitable methods. In business model research, the requirements for business model innovation are also referred to as innovation barriers or challenges (Chesbrough, 2010; Frankenberger et al., 2012). Requirements need to be met while barriers or challenges need to be addressed to allow for business model innovation. Hence, requirements and challenges or barriers are included in the following overview, hereinafter referred to as requirements only.

To provide a comprehensive list of requirements to business model innovation, the literature identified in the initial literature has been searched for the following keywords: “business model innovation requirement” and “business model innovation barrier.” Seven articles that focus on requirements for business model innovation have
been identified, and in these articles, seven requirements have been identified, of which five are especially relevant for the idea generation phase:

- Enhance creativity (Frankenberger et al., 2012; Voelpel et al., 2004),
- Deal with the complexity of the task (Auer & Follack, 2002; Doz & Kosonen, 2010; Peterovic et al., 2001).
- Facilitate knowledge structuring and sharing (Peterovic et al., 2001).
- Create a learning environment and challenge mental models (Peterovic et al., 2001, p. 5).
- Overcome cognitive barriers (Chesbrough, 2010; Prahalad & Bettis, 1986) (Frankenberger et al., 2012).

Two of these identified requirements are relevant for the whole business model innovation process: to facilitate strategic agility (Doz & Kosonen, 2010) and to facilitate experimentation while embracing both risk and insecurity of the task (Chesbrough, 2010; Doz & Kosonen, 2010; McGrath, 2010; Meehan & Baschera, 2002; Peterovic et al., 2001). To gain a better understanding of which requirements are most important for business model innovation, the requirements identified in the first literature search have then been included in the extended literature review of all of the business model research incorporated in this review. In the screening of the literature, a total of 39 articles are referred to for identifying a comprehensive list of requirements. Table 1 provides an overview of the complete requirements identified in the business model literature.
## Business Model Ideation Requirements

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<th>Creativity</th>
<th>Facilitate Strategic Agility</th>
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<td>Support knowledge structuring and sharing, (Communication/discussion/reflection)</td>
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<td>Requirement 1</td>
<td>Requirement 2</td>
<td>Requirement 3</td>
<td>Requirement 4</td>
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<td>Svejenova et al., (2010)</td>
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<td>Taran et al., (2009)</td>
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<td>Teece (2010)</td>
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<td>Thompson and MacMillan (2010)</td>
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<td>Vianjic and Neely (2011)</td>
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<td>Wirtz et al., (2010)</td>
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<td>Yunus et al., (2010)</td>
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<td>Zott and Amit (2007)</td>
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</table>

**Table 1: Business Model Innovation Requirements**
Overall, it is important to acknowledge that there are general requirements for business model innovation and prerequisites for innovation processes that also apply to generating novel business model ideas. However, these requirements cannot be met through the choice of an idea generation method and are thus not of primary concern in this literature review. In Table 1, all requirements that have been identified in the literature are separated into primary business model idea generation requirements and requirements for the whole innovation process. In the following section, the requirements for the whole process are discussed, followed by the requirements for business model idea generation.

Important to the whole business model innovation process is, for example, the ability to retain strategic agility, which is defined as strategic sensitivity, leadership unity, and resource fluidity facilitation (Doz & Kosonen, 2010). All three requirements are not only important for the idea generation phase but for the whole business model innovation process and can hence be considered prerequisites for business model innovation in incumbents. However, they cannot be tackled by any methodologies and are thus not of primary concern in this literature review.

Another prerequisite to both developing and implementing business model ideas is to address associated risks for the current business model, deal with risk and reduce risk, as “managers who initiate business model innovation and corporate executives who judge the final merit of innovation proposals will depend on an organizational context that allows for, even encourages, both initiative and risk-taking. Innovation requires risk-taking behavior on the part of initiators” (Santos et al., 2009, p. 36). One way of limiting risk is to conduct risk-minimizing experiments with already developed ideas: “Being able to predict the outcomes more accurately through the support of risk free experiments is thus an important prerequisite” (Peterovic et al., 2001, p. 4). Hence, teams need to be enabled to take risks associated with business model innovation and be “willing to consider business model redefinition, and, more importantly, able to achieve collective commitment to taking the risks necessary to venture into new business models and (more difficult) to abandon old ones.” (Doz & Kosonen, 2010, p. 376). However, this cannot be incorporated by methods for the generation of business model ideas but is important to set the organizational context.
Especially interesting, however, are requirements that are relevant for the idea generation phase. In total, seven requirements have been identified in the business model innovation literature, depicted in Table 1:

- enabling creativity,
- structuring knowledge and sharing, communicating, and reflecting,
- analysis and understanding,
- dealing with complexity,
- visualizing and tangibility of ideas,
- addressing barriers, and
- changing mental models.
Each of these requirements will briefly be discussed below.

For business model idea generation, facilitating creativity is essential but especially difficult for teams facing wicked tasks. Moreover, establishing creativity as a company-wide capability, for example by creating acceptable degrees of disorder that stimulate creativity, has been suggested in recent research (Frankenberger, et al., 2012; Voelpel, et al., 2004). Teece argues: “Designing a new business model requires creativity, insight, and a good deal of customer, competitor and supplier information and intelligence.” (Teece, 2010, p. 188). Fostering creativity is further possible, when cognitive barriers are removed, for example by different creativity mechanisms, such as distancing and abstracting (Attneave, 1954). Before developing novel business model ideas, it is crucial to analyze and understand the current business model of the firm. Further, support is required for handling complex problems statements and systems (Chatterjee, 2010; Chesbrough, 2010; Doz & Kosonen, 2010). The idea generation method should further not add complexity but instead “be able to handle complex systems“ (Peterovic et al., 2001, p. 4) and thus reduce the complexity of the task. Complexity is further reduced when knowledge is shared and combined in order to develop novel business model ideas. Knowledge structuring and sharing (Peterovic, et al., 2001) are essential for the generation of new ideas, as well as the creation of a learning environment (Auer & Follack, 2002; Peterovic et al., 2001). Peterovic and colleagues argue specifically (2001: 4): “The methodology should support the structuring and sharing of knowledge”, which in turn, is facilitated when mental models are explained, structured, and visually mapped in teams. To be able to effectively change business models, which are based on the mental models, as Peterovic and colleagues (2001) argue, learning has to be facilitated in three (iterative and flexible) stages:
mapping mental models, challenging mental models, and improving mental models—in sum, continually extending and testing mental models (Peterovic et al., 2001, p. 5).

Osterwalder and Pigneur (2010) highlight the importance of visualizing the business model, both in its current, malfunctioning state and the newly developed business model ideas. Visualization is argued to facilitate the analysis and communication of the business model (Doganova & Evquem-Renault, 2009), as well as tackle the complexity of the task (Auer & Follack, 2002; Doz & Kosonen, 2010; Peterovic et al., 2001). Therewith, visual elements included in any idea generation method appear to satisfy multiple other requirements needed to develop business model ideas.

As some of the requirements overlap, Table 2 synthesizes the discussion above in the form of three requirements that are most important to consider when selecting a suitable method for generating business model ideas.

<table>
<thead>
<tr>
<th>Contributing Requirements</th>
<th>Knowledge and Understanding</th>
<th>Creativity</th>
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<tbody>
<tr>
<td></td>
<td>• Structure &amp; share knowledge</td>
<td>• Enable creativity</td>
</tr>
<tr>
<td></td>
<td>• Communicate/discuss/reflect</td>
<td>• Enable learning: Address cognitive barriers/mental models</td>
</tr>
<tr>
<td></td>
<td>• Analyze &amp; understand</td>
<td>• Change mental models</td>
</tr>
<tr>
<td></td>
<td>• Address and reduce complexity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enable learning: Address cognitive barriers/mental models</td>
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</tbody>
</table>

Table 2: Summary of Business Model Idea Generation Requirements

The requirement “knowledge and understanding” summarizes the requirements concerned with understanding and analyzing the task (Osterwalder & Pigneur, 2010; Zott & Amit, 2010) to reduce complexity (Chatterjee, 2010; Doz & Kosonen, 2010) and create a common understanding (Johnson et al., 2008) as well as to create a learning environment in which knowledge can be shared (Peterovic et al., 2001) and new knowledge created. Further, analysis, understanding, and knowledge creation are combined as these requirements are most often supported at the same time. The next “core” requirement is to foster “creativity,” which is met when cognitive barriers are removed (Frankenberger et al., 2012) and mental models are questioned and changed. While creativity seems to be an obvious requirement for methods derived from idea generation research, it is not necessarily one for methods derived from business model innovation research, where most methods appear rather analytically focused. And even
though idea generation methods may foster creativity *per se*, some appear more structured and analytical than others. “Visualization and tangibility” is the final core requirement for business model idea generation, as it supports knowledge structuring (Osterwalder & Pigneur, 2010) and at the same time reduces the overall complexity of the task by making knowledge and structure visible for analysis and new idea development.

The following section provides an overview of business model innovation methods as recommended in business model research.

### 2.3.2. Business Model Innovation Methods

In this section, business model innovation methods are identified from business model innovation literature, with particular emphasis on identifying methods that are specifically designed to enable the generation of business model ideas. So far, little research has been conducted on how incumbent firms actually proceed to develop a new business model and which methods they use to do so. Firms appear to eventually arrive at a new business model, while the process remains unidentified (Johnson, et al., 2008; Meehan & Baschera, 2002). However, despite the “emergent” character of new business models, a growing number of scholars aim to offer guidance for the innovation process (Doz & Kosonen, 2010). Ten articles have been identified as specifically mentioning and describing a business model innovation method of any kind. In total, 28 articles on ways to innovate the current business model have been identified. An overview of the identified methods is presented in Table 3. The methods have been sorted based on the phase of the innovation process they tackle. The following section first describes literature that deals directly with idea generation. Then it briefly touches on those methods that are not directly concerned with idea generation.

To facilitate and foster business model innovation, scholars focused early on business model components (Osterwalder & Pigneur, 2005; Shafer et al., 2005). The business model components most widely recognized are the nine elements Osterwalder and Pigneur (2010) introduce in their canvas: customer segments, customer relationships, channels, value proposition, revenue streams, key resources, key activities, key partners, and cost structure. In a different theoretical framework, Amit and Zott (2010) consider two sets of parameters necessary for business model innovation: *design elements* (content, structure, and governance) and *design themes* (novelty, lock-in, and
value creation). The authors argue that a business model may be understood as a firm's activity system. Thereby, they aim to offer a framework including six stimulating questions for developing new business models through combination. Put into practice, the components approach is followed by scholars who examine how business model templates facilitate innovation. Different business model components are provided in a comprehensive template or canvas, which, leading the team through a fixed number of consecutive boxes and visualizing relationships between components, shall enable firms to arrive at new business models. The business model canvas developed in previous research and practically applied by Osterwalder and Pigneur (2010; 2002; 2005) and similarly by Linder and Cantrell (2000) is an established template in this respect and probably the most commonly used idea generation method in practice.

Other idea generation methods, such as the value network (Frankenberger, et al., 2012) or the environmental scanning approach (Voelpel, et al., 2004) are rather analytical procedures suggested for the development of ideas, which are reminiscent of the roots of business model innovation research in the strategy literature.

The second stream of literature focuses on a few more or less comprehensive methodologies. The overview provided by Pateli and Giaglis (2005) allows for a first assessment of the research. In addition, they offer their own, scenario-based approach in three main steps: understand the current business model, assess the influence of technology innovation, and change. However, they only mention the change process itself but do not describe it. Jonda (2007) also favors scenarios for business model innovation, while Voelpel and colleagues (2005) have suggested "sensing" customer needs as an approach to business model innovation. Related to the scenario-based approach is the experimentation with different business models, as suggested by Chesbrough (2010). While these approaches do not describe how the firm arrives at new business models, it is a valuable, risk-reducing opportunity to examine new business models before the final implementation. Peterovic and colleagues (2001) and Auer and Follack (2002) both propose the evolaris methodology for e-business model innovation specifically, which is based on the three learning stages of Senge and Sterman (1992). Evolaris comprises six steps: (1) identify the problem from different perspectives, (2) identify key factors of the problem, (3) model the core reinforcing and balancing feedback loops, (4) expand the model to achieve a comprehensive network, (5) recognize and interpret possibilities for changing the problem situation and recognize steering potential, and (6) develop an action plan. This method is based on the authors’ comprehen-
sive assessment of business model innovation requirements (Peterovic, et al., 2001) as covered in the previous section.

The methods presented in Table 3 provide an overview of all business model innovation methods discussed in the literature. The methods explicitly recommended for idea generation are highlighted within all other methods; specific references to idea generation are printed in bold.
<table>
<thead>
<tr>
<th>Innovation Phase</th>
<th>Proposed Method</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea Generation</td>
<td>Guided Fantasy (Groupware-based)</td>
<td>&quot;The Guided Fantasy technique (GF) is an intuitive technique that instructs participants to use a fantasy world distant from the problem to help think of unusual ideas to solve the proposed problem.&quot; (p. 328)</td>
<td>(Couger, 1995; Garfield, et al., 2001)</td>
</tr>
<tr>
<td>Analysis; Idea Generation</td>
<td>Value Network</td>
<td>Two steps are suggested: A) Managers need to understand their own value network by assessing their value chain, key players within its ecosystem and as well as key player’s ecosystem. B) “the focal firm needs to overcome the dominant logic and create ideas about moving into a different value chain position” (p. 7) No specific suggestions are provided on how the ideas are generated to move into a different value chain.</td>
<td>(Frankenberger, et al., 2012)</td>
</tr>
<tr>
<td>Analysis &amp; Comparison; Idea Generation</td>
<td>Pattern Confrontation</td>
<td>The approach suggests mapping the current Business Model and identifying competitors/ other industry business models. When talking about patterns, the authors refer also to templates (Doganova &amp; Eyquem-Renault, 2009), analogies and maps to identify new business models, which is, to look at business models “which have proven successful at multiple firms” (p.8). The patterns are argued to help support overcoming the dominant logic, and suggest using triggering questions, such as “How would McDonalds conduct our business” (p. 8).</td>
<td>(Frankenberger, et al., 2012)</td>
</tr>
<tr>
<td>Idea Generation</td>
<td>Value Curve/Blue Ocean</td>
<td>Three steps are identified for business model Innovation idea generation: A) The industry is defined, B) The value curve for the industry is developed, which is referred to as red ocean (Kim &amp; Mauborgne, 2005), which is used as base to draw the firms value curve, C) Four concepts are applied to generate ideas for the new value curve: Reduce, create, raise, and eliminate.</td>
<td>(Frankenberger, et al., 2012; Kim &amp; Mauborgne, 2005)</td>
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<tr>
<td>Idea Generation, Business Model Design</td>
<td>Three A’s</td>
<td>Based on an analysis of 28 cases, IBM identified a set of characteristics combined in the Three A’s that strong business model innovators demonstrate consistently: A) Aligned – Leverage core capabilities and enforce consistency across all dimensions of the business model, both internally and externally, that build customer value, B) Analytical – Use information strategically to create foresight, and prioritize actions while measuring and tracking for rapid course correction, C) Adaptable – Link innovative leadership with the ability to effect change and create operating model flexibility.</td>
<td>(IBM, 2009)</td>
</tr>
<tr>
<td>Idea Generation, Analysis of BM</td>
<td>Change Model Framework</td>
<td>Accenture’s Working Paper provides an overview of potential business models and a framework guiding thought the process of developing new business models by focusing on the status quo of the organization similar to the business model canvas by Osterwalder and Pigneur (2010).</td>
<td>(Linder &amp; Cantrell, 2000)</td>
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<tr>
<td>Idea Generation</td>
<td>Design Thinking</td>
<td>Design Thinking is suggested as approach to develop one new business model ideas by generating and refining many ideas following the iterative design thinking process and applying various techniques and tools: A) (Re)define the problem, B) Needfinding and instant expertise, C) Brainstorm, D) Prototype, E) Test. Ideas are derived from customer needs and generated by using a variety of creativity techniques, different idea generation methods are proposed within this method.</td>
<td>(Meinel &amp; Leifer, 2011; Vetterli, et al., 2012)</td>
</tr>
<tr>
<td>Analysis; Idea Generation</td>
<td>Canvas</td>
<td>Osterwalders Canvas depicts nine business model components: Key partners, key activities, key resources, value proposition, customer relationships, challenges, customer segments, cost structure, revenue structure.</td>
<td>(Osterwalder &amp; Pigneur 2010)</td>
</tr>
<tr>
<td>Idea Generation</td>
<td>Sensing customer needs (Environmental scanning)</td>
<td>Four dimensions: A) Customer sensing, B) Technology sensing, C) Business infrastructure sensing, D) Economics/ profitability sensing. All of these dimensions may create ideas which are incorporated in novel business models.</td>
<td>(Voelpel, et al., 2005; Voelpel, et al., 2004)</td>
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<tr>
<td>Whole Innovation Process</td>
<td>Scenario-based approach</td>
<td>Three steps: 1) Understand the current business model, 2) Assess the influence of technology innovation, 3) Change.</td>
<td>(Chanal &amp; Caron-Fasan, 2008; Pateli &amp; Giaglis, 2005)</td>
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| Test of Business Model Ideas; Implementation | Experimentation | The experimental approach suggested is meant to facilitate the exemplary test, or “Probe” of a newly developed business model idea: "Short of accurate forecasting and scenario planning, experimenting provides insights that may prove useful to adapt business models. ‘Probing’ can allow one to experience the future, provided the probes are well directed." (Doz & Kosonen, 2010: 373 1997). "Of course, experiments, per se, are not going to change business models e but they may be very valuable precursors, in two ways. First, they may challenge core business assumptions, or at least help to define and sharpen them. Second, they may prototype and pilot change, in particular in multi-unit/multi-site companies" (Doz & Kosonen, 2010: 373). | (Chesbrough, 2010; Doz & Kosonen, 2010) |
| Test/ Challenge of Business Model Ideas | Six Questions | Six questions are suggested: 1) What perceived needs can be satisfied through the new model design?, 2) What novel activities are needed to satisfy these perceived needs?, 3) How could the required activities be linked to each other in novel ways?, 4) Who should perform each of the activities that are part of the business model? Should it be the company? A partner? A customer? What novel governance arrangements could enable this structure?, 5) How is value created through the novel business model for each of the participants? 6) What revenue model fits the company’s business model to appropriate part of the total value it helps create? | (Amit & Zott, 2012, p. 47) |
| Whole Innovation Process | Evolaris | The 6-step methodology suggested by Peterovic and colleagues has been applied by Auer and Follack: 1) Identify the problem from different perspectives on it, 2) Identify key factors of the problem, 3) Model the core reinforcing and balancing feedback loops, 4) Expand the model to full a network, 5) Recognize and interpret possibilities for changing the problem situation, recognize steering potential, 6) Develop action plan. | (Auer & Follack, 2002; Peterovic, et al., 2001) |
Three areas are important to change the current model: A) Dramatic redesign of end-to-end value chain architecture to reduce costs or enhance value, B) Transformation of value customers receive by providing new solutions, C) Redefining customer base by discovering & serving hidden customer segments. (Gupta & Govindarajan, 2001)

The organization needs to first identify the level of change, and thus the change model, they want to introduce and then proceed by building the organizational machinery required for executing their change model. To do so, a general framework is suggested, classified based on the level of change introduced by the new business model: 1) Realization, 2) Renewal, 3) Extension, 4) Journey models. (Linder & Cantrell, 2000)

Four steps to transforming a business model, responding to the need for changing the firm’s technology infrastructure, and thereby the underlying business model: 1) Identification of players, 2) Highlight of value flows, 3) Identification of key competitive drivers, 4) Construction of a feedback chain. (Papakiriakopoulos et al., 2001)

Identified six steps for changing a current business model to one of five b-web models:
1. Describe the current value proposition from the customer's viewpoint, that is, why this system exists, 2. Disaggregate: Consider the contributors and their contributions, strengths, and weaknesses. Compare the parts and capabilities of your business to those in other systems, 3. Envision b-web-enabled value through brainstorming and other creative design techniques. Decide what the new value proposition will be, 4. Re-aggregate: Define what it will take to deliver the new value proposition, including processes, contributors, contributions, applications and technologies, and other success factors, 5. Prepare a value map: Design a visual map that depicts value exchanges in the b-web, 6. Do the b-web mix: For the generation of business model ideas “brainstorming and other creative design techniques” are suggested in step 3 without further specification. (Tapscott, et al., 2000)
An iterative design process for the development of new business models is proposed. The main task is to select one ideal type, set objectives and build a manageable activity system. It is argued that the ideal business model types will provide the perfect fit for the current business model. Based on the selection of one business model out of four described in developed typology: A) Asset Heavy, B) IP Based, C) Installed Base, D) Hub (Asset Light).

Business Model Innovation for social businesses is conducted along five lessons: 1) Challenge conventional wisdom, 2) Find complementary partners, 3) Undertake continuous experimentation, 4) Favor social profit-oriented shareholders, 5) Specify social profit objectives clearly. New ideas may be generated by challenging conventional wisdom in step 1, however, the authors provide no specifications on how to develop social business model ideas.

The purpose of this model is therefore to illustrate a practical implementation process to business model innovation in a linear and systematic manner. The point of departure (stages one and two) begins with visualizing the core components and the ‘as-is’ strategy of the current operational business model. Then, the process will continue by following a ‘stage-gate’ procedure to the implementation of the new business model. Each gate provides an opportunity for risk management activities: 1. Identify various risks – what can be the risk? Under what circumstances it can happen?, 2. Analyze the various risks – what is the likelihood that it will occur? 3. Evaluate those risks – determine the level of risk that a business is willing to accept, 4. Treat the risks – avoiding/reducing/retaining/ transferring … innovating.

<table>
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<th>Table 3: Business Model Innovation Method</th>
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<tr>
<td><strong>Whole Innovation Process</strong></td>
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<td><strong>Whole Innovation Process</strong></td>
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<td><strong>Whole Innovation Process</strong></td>
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(Chatterjee, 2010)  
(Yunus, et al., 2010)  
(Taran et al., 2009)
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Table 3 shows 9 methods that have been identified as recommended specifically for the generation of business model ideas. In the following section, the idea generation literature is reviewed to identify further methods potentially suitable for the task before the identified methods are evaluated.

2.4. A Review of Idea Generation Methods

Ever since the publication of Osborn’s (1957 influential work “Applied Imagination,” dozens of idea generation techniques have been developed and proposed to focus on and enhance the creativity of individuals and groups (VanGundy, 1981). The goal of idea generation is to create a pool of ideas for further evaluation, refinement, and ultimately implementation (Garfield, et al., 2001). Idea generation methods, the most widely known one being brainstorming, are applied in various organizational settings, such as meetings, and for different tasks, such as product development. The research method most often applied by researchers are student experiments, aiming to compare different idea generation methods, such as brainstorming and electronic brainstorming (Aiken et al., 1994; Connolly et al., 1993; Gallupe & Cooper, 1993) and measuring the limits of those methods (Girotra et al., 2010; Shah et al., 2000; Shah et al., 2003).

Research on idea generation has a longstanding tradition in social psychology, where most of the articles on idea generation methods have been published. Other fields are education research, product development, and marketing, just to name a few major ones. The research field is mature, with many comprehensive literature reviews having been published already (Coates et al., 1996; Conway & McGuinness, 1986; VanGundy, 1981) and a set of classifications available (Couger, 1995; Garfield, et al., 2001; Shah, et al., 2000; Sowrey, 1990; Ward, 2004). As much of the research takes the form of experiments, emphasis has been put on understanding contextual factors (Howell & Boies, 2004) such as group composition (Dayan & Di Benedetto, 2009; Nijstad & Stroebe, 2006), the mood of team members (Jones & Kelly, 2009), pressure (Myers, Aronson, & Wharton, 1999), and the provision of feedback (Garfield et al., 1997), to name a few. Little research, however, has focused on the selection of idea generation methods for specific tasks, or a particular problem scope (VanGundy, 1981) even though research has pointed toward the importance of the task for selecting methods: “Arguably, a major cause of inconsistent findings by researchers evaluating creativity methods is inadequate attention to idea-generation tasks. A technique might work well in some tasks and poorly in others.” (Smith, 1998, p. 129).
The literature review of idea generation methods identifies 64 different, stand-alone idea generation methods with substantial research about them. Hence, this set of methods does not represent an exhaustive set of idea generation methods and their variations. Understanding the differences among idea generation methods regarding their benefits and pitfalls is important to allow for the selection of idea generation methods suitable for the task of business model idea generation. To understand the differences between the identified methods, a suitable classification is required. Therefore, in the following section, idea generation classifications are briefly discussed, and the most suitable one is selected to present an overview of the identified idea generation methods from the literature review.

2.4.1. Idea Generation Classifications

To identify idea generation methods suitable for business model innovation, this chapter first identifies classification principles and presents them in Table 5. The chapter then assesses the suitability of idea generation methods for the ill-defined task of business model idea generation by applying one specific classification principle.

Among the most basic classifications found in the literature is the one between team-based methods and methods suitable for individual idea generation (VanGundy, 1981). Toubia (2006, p. 417) argues that idea generation methods may be classified based on their inherent view on creativity. For example, anarchy of thought was long considered key to foster idea generation, which has led to the development of methods such as brainstorming (Osborn, 1957) or lateral thinking (De Bono, 1970). Toubia (2006, p. 417), to the contrary, argues that structure is key to creativity. The methods introduced in recent research, such as creativity templates (Goldenberg et al., 1999), therefore allow for “detailed application of well-defined operations” (Toubia, 2006, p. 418).

Hence, one of the most commonly used classifications clusters idea generation methods based on their support for either divergent or convergent thinking (Shah, et al., 2000; Shah, et al., 2003), which is also referred to as analytical/logical or intuitive in nature (Couger, 1995; Garfield, et al., 2001, p. 377; Shah et al., 2000). Shah and colleagues (2000) differentiate intuitive and logical methods further into five subcategories: germinial, transformational, progressive, organizational, and hybrid, and the logical methods into two subcategories: history based and analytical. Schlicksupp (1977)
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refers to the most common categorization of six main categories: brainstorming methods, brainwriting methods, methods of creative orientation, creative confrontation, systematical structuring, and systematical problem specification. Idea generation methods found may also be distinguished based on certain features the method displays, such as computer-mediated, electronic brainstorming, GDSS, and GUNGEN, or conducted face-to-face such as traditional brainstorming. They might also be differentiated as complex methods consisting of multiple sub-methods and multiple required steps of analysis to derive new ideas such as Nominal Group Technique or more simple, such as, again, brainwriting (Gist, 1989; Heslin, 2009).

An analysis of the idea generation literature has identified seven classification principles that have been applied over the years to distinguish between idea generation methods. Table 4 presents an overview of classifications found in the idea generation literature.

<table>
<thead>
<tr>
<th>Focus</th>
<th>Classification Principle</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people participating</td>
<td>Alone vs. group/team-based</td>
<td>(Aiken, et al., 1994; Bouchard et al., 1974; VanGundy, 1981)</td>
</tr>
<tr>
<td>Creativity mechanism of the methods/tools applied</td>
<td>Analytic/logical vs. intuitive trigger/support of divergent or convergent thinking</td>
<td>(Couger, 1995; De Bono, 1970; Garfield, et al., 2001; Schlicksupp, 1977; Shah, et al., 2000; Toubia, 2006)</td>
</tr>
<tr>
<td>Idea generation stages</td>
<td>Stages of idea generation process</td>
<td>(Schlicksupp, 1977; VanGundy, 1981)</td>
</tr>
<tr>
<td>Creative process/creativity principles</td>
<td>Initial problem formulation vs. conceptual combination vs. analogical reasoning</td>
<td>(Pfister &amp; Eppler, 2012; Smith, 1998; Ward et al., 2004)</td>
</tr>
<tr>
<td>Mediation</td>
<td>Computer-mediated vs. face-to-face</td>
<td>(Petrovic &amp; Krickl, 1994; Rietzschel et al., 2006)</td>
</tr>
<tr>
<td>Task</td>
<td>Broad/medium and narrow problem statements; Five different problem statements: Search, Analysis, Constellation, Selection, and Consequence</td>
<td>(Schlicksupp, 1977; VanGundy, 1981)</td>
</tr>
</tbody>
</table>

Table 4: Idea Generation Classification Principles
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The most suitable classification to identify methods appropriate for business model innovation has been introduced by VanGundy (1981), which classifies methods based on task affordances. VanGundy (1981) classifies problem statements into broad, medium, and narrow statements and suggests matching the complexity of the method with the complexity of the task, while at the same time considering the appropriateness of the method. Further, the method should be easy to learn and apply with no additional complexity added to the already complex task without being too simple, and the method should facilitate the selection of generated ideas. Recent idea generation research has focused to a large degree on how teams can be enabled to select the best idea they have developed (Rietzschel et al., 2010). Therewith, the best potential match is achieved for the aim of this literature review: to identify methods suitable for the specifically complex and wicked task of business model innovation.  

2.4.2. Sorting Idea Generation Methods

In this section, the idea generation methods identified in the idea generation literature review have been clustered using VanGundy’s (1981) task classification. VanGundy (1981, p. 28) argues that “considerable difficulty could be encountered in attempting to select one or a few methods for application to a problem.” Teams might be concerned with cost-effectiveness, time availability, problem scope, implementation difficulty, and special training requirements for using a method. The suggested rationale is “appropriateness” of the method for the specific demands of the problem, the team, and the organization.

The general guideline offered by VanGundy (1981, p. 30) is to “select techniques that are proportionate in complexity to the problem scope,” that is, to select a complex method for a complex problem, for example. Table 6 depicts an overview of the idea generation methods identified by VanGundy (1981); the methods identified in this review of idea generation literature classify statements according to their complexity and match for three problem scopes: broad, medium, and narrow. While VanGundy (1981) includes individual and team methods, this literature review focuses only on methods applied in teams. Therefore, all individual techniques have been excluded. However, while VanGundy (1981) considers both “Analogies” and “Metaphors” to be

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3 Schlicksupp (1977, p. 61) clusters methods based on different types of problem statements into five specific problems: search, analysis, constellation, selection, and consequence problem statements. However, his classification does not include any cluster broad and specific enough to match the task of generating business model ideas, so the classification by VanGundy is preferred.

4 VanGundy (1981) notes that methods might be combined and with the newly gained complexity become suitable for more complex problem statements.
individual techniques, current research has shown that those are also applicable in a group context (Hey, 2007). Therefore, those individual methods that have been assessed as collaborative methods are included even though they might not have been considered in the original classification by VanGundy. Again, techniques identified in the literature review have been added and marked with a star.
## Task (Problem) Scope

<table>
<thead>
<tr>
<th>Broad</th>
<th>Medium</th>
<th>Narrow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method</strong></td>
<td><strong>Source</strong></td>
<td><strong>Method</strong></td>
</tr>
<tr>
<td>Delphi/ Q-</td>
<td>(Aiken &amp; Classical Brain-</td>
<td>Talking Picture</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Creative Problem Solving</th>
<th></th>
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<tr>
<td>Nominal Group Technique</td>
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<tr>
<td>Lateral Thinking</td>
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<td></td>
</tr>
<tr>
<td>Design Thinking*</td>
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</tbody>
</table>
## Table 5: Classification of Idea Generation Methods According to their Appropriateness for Problem Scope (VanGundy 1981)

<table>
<thead>
<tr>
<th>Method</th>
<th>Source(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Sketching*</td>
<td>Yang, 2000; van der Lugt, 2002; VanGundy, 1981</td>
</tr>
<tr>
<td>Phases of Integrated Problem Solving</td>
<td>(VanGundy, 1981)</td>
</tr>
<tr>
<td>Creativity Template*</td>
<td>(Goldenberg, et al., 1999; Toubia, 2006)</td>
</tr>
<tr>
<td>Morphological Box/ Analysis</td>
<td>(Coates, et al., 1996; Schlicksupp, 1977; VanGundy, 1981; Zwicky, 1969)</td>
</tr>
<tr>
<td>Collaborative Prototyping*</td>
<td>(Z. Chen, 1999)</td>
</tr>
<tr>
<td>Six Thinking Hats*</td>
<td>(De Bono, 1970, 1985)</td>
</tr>
<tr>
<td>TRIZ Contradiction Analysis*</td>
<td>(Li et al., 2006)</td>
</tr>
<tr>
<td>Philipps 66</td>
<td>(VanGundy, 1981)</td>
</tr>
</tbody>
</table>
Most of the methods are suitable for medium tasks, as shown in Table 5, while the most relevant methods for this literature review are most likely to be found in the section on methods suitable for complex or broad problems. The methods highlighted with a star have been added based on the literature review. Still, the overview is by no means an exhaustive set of idea generation methods. First, not all existing idea generation techniques have been included, but rather only those identified in the idea generation literature. Examples include idea generation methods suggested solely in other literature streams such as the marketing literature that proposes customer visits, customer active paradigm, focus groups, user observation, lead user analysis, and the customer value determination process (Fern, 1982; Flint, 2002; Lilien et al., 2002), or market and product analytical tools, such as environmental scanning, SWOT analysis, benchmarking, gap analysis, product analysis, technological breakthrough scanning, ethnography, focus groups, and market analysis (Börjesson, et al., 2006; Sowrey, 1990) to generate ideas. These idea generation methods are in the first place traditional management tools, which are not included in the core idea generation literature, though they may also lead to the generation of new ideas. Second, not all identified references have been included, but instead only the most important ones. For example, the amount of research focusing on brainstorming alone is overwhelming, and the provision of an exhaustive overview does not lead to answers to the research questions of this article.

VanGundy’s (1981) classification facilitates a broad overview of the existing idea generation methods while at the same time allowing for a first identification of methods suitable for complex idea generation tasks. However, to derive idea generation methods suitable for the task of business model ideation, those methods identified in the business model innovation literature, as well as those methods generally suitable for complex idea generation tasks from idea generation literature, are to be clustered based on the additional criteria derived from the business model innovation research. In order to do so, the development of a combined framework in the following chapter is suggested. The underlying categorization strategy is based on the type of problem that needs to be solved in a team: New business model ideas need to be generated, posing a wicked problem to innovation team members.
2.5. Business Model Idea Generation Methods: Framework Development

Business model innovation is a complex, ill-defined, and therewith wicked task (Rittel & Webber, 1973) that involves numerous requirements, such as cognitive challenges about the dominant logic of the firm (Chesbrough, 2010), handling and reducing complexity (Auer & Follack, 2002; Peterovic, et al., 2001), fostering creativity (Frankenberger, et al., 2012; Voelpel, et al., 2004), facilitating knowledge creation and exchange (Peterovic, et al., 2001), and therewith reducing the associated risk (Doz & Kosonen, 2010; McGrath, 2010; Meehan & Baschera, 2002; Peterovic, et al., 2001).

All requirements that are specifically targeted at business model idea generation can be combined into three comprehensive requirements for business model idea generation methods: fostering knowledge creation and understanding, supporting creativity, and embracing some form of visualization and tangibility, which are depicted in the framework of Figure 3.

Methods that are highly complex and time consuming to learn require a high level of pre-knowledge or demand expensive, potentially available software, though generally suggested by VanGundy (1981) for complex idea generation tasks, have not been included, such as TRIZ (Consortium, 2005) and Lateral Thinking. This thinking style requires further specific tools and methods that may vary to a large degree (De Bono, 1970). All methods that are potentially suitable for the task of business model generation according to the three identified criteria have been included in the Venn diagram. Hence, the overlapping core of the Venn diagram is especially interesting as it depicts methods that fulfill all three criteria and should be the most suitable idea generation methods for business model ideation.
Figure 3: Clustered Idea Generation Methods

In the Venn diagram in Figure 3, one can see that of methods suggested in idea generation literature for complex idea generation and in business model innovation literature for idea generation, none focus solely on visualization or visualization and creativity. Most methods focus on fostering knowledge and understanding while at the same time fostering creativity. For this research endeavor, the methods in the center of the Venn Diagram are most relevant since they combine all three major requirements for developing business model ideas: the business model canvas in either of its variations (Linder & Cantrell, 2000; Osterwalder & Pigneur, 2010), Value Curve/ Blue Ocean (Frankenberger, et al., 2012; Kim & Mauborgne, 2005), Design Thinking (Meinel & Leifer, 2011; Vetterli, et al., 2012), Collaborative Sketching (Shah, et al., 2001), Battelle-Bildmappen-Brainwriting (VanGundy, 1981), and Visual Synectics. (Schlicksupp, 1977; VanGundy, 1981). Any of the six methods is potentially highly suitable for the generation of new business model ideas.

In Table 7, the methods are briefly introduced based on their contribution to facilitate creativity, knowledge and understanding and visualization and tangibility.
## Criteria/Method Description

<table>
<thead>
<tr>
<th>Criteria/Method</th>
<th>Method Description</th>
<th>Creativity</th>
<th>Knowledge and Understanding</th>
<th>Visualization and Tangibility</th>
</tr>
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<tbody>
<tr>
<td>Business Model Canvas (Linder &amp; Cantrell, 2000; Osterwalder &amp; Pigneur, 2010)</td>
<td>The business model canvas as developed by Osterwalder and Pigneur (2010) depicts nine business model elements on a single page. The suggested proceeding begins on the right side of the canvas and moves to the left side. The two sides are compared to the sides of the brain – the right side items represent emotions, or the value that is created, while the components on the left side rely on logical understanding, or the efficiency behind the business model. First, Customer Segments are identified, followed by the Value proposition. Afterwards, Delivery Channels and Customer Relationships are mapped before Revenue Streams are visualized. Key Resources, Key Activities, and Key Partnerships follow before the Canvas is completed by visualizing the Cost Structure.</td>
<td>Creativity is enhanced by visualizing the current business model, triggering questions, achieving a joint identification and analysis of business model components, and using visual techniques such as sketching, which is suggested for the use of the canvas.</td>
<td>The business model building blocks allow for the identification and analysis of the current business model as well as the identification of problem areas. Both the big picture and the relationships between components are visible on only one page. The analysis supports the creation of a common understanding of the status-quo and areas for improvement. By exchanging knowledge on different aspects of the business model, the creation of joint knowledge across departments and positions is supported and a common language is created.</td>
<td>The business model building blocks are represented in a template, which is a schematic visualization. It may be filled in with simple writing, Post-its, or sketches. The visualization also creates affordance (Gibson, 1977), as thus far empty boxes prompt the team to discuss and fill those boxes. The visualization of the business model creates a common understanding, its individual components and the relationships between the components. After the defining the business model visually, visual storytelling is suggested, and creating many different visual prototypes of potential business model ideas.</td>
</tr>
<tr>
<td>Value Curve</td>
<td>The method outlines three steps on how to develop novel business</td>
<td>Four guiding questions aim to trigger creativity: To create a common understanding of the status quo,</td>
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<table>
<thead>
<tr>
<th>Blue Ocean (Frankenberg et al., 2012)</th>
<th>Design Thinking (Meinel &amp; Leifer, 2011; Vetterli et al., 2012)</th>
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<tr>
<td>model ideas. 1. Define industry and identify the main competitive factors within the industry. 2. Develop the value curve for the industry (the Red Ocean). Based on the industry curve, the curve for the focal company's current business model is developed (often identical with the industry curve). 3. Create a new value curve with the help of four questions, which is different from the industry value curve. (“Leap out of the Red Ocean into the Blue Ocean.”) The four questions are: reduce, create, raise and eliminate.</td>
<td>Design thinking is a human-centered innovation method to generate and test many ideas, and develop those ideas further in order to select one best idea (Meinel &amp; Leifer, 2011; Vetterli et al., 2012). Central elements are deep customer understanding, structured idea generation by using Brainstorming, Brainwriting and rapid prototyping.</td>
</tr>
<tr>
<td>1. Reduce: Which factors should be reduced well below the industry's standard? 2. Create: Which factors should be created that the industry has never offered? 3. Raise: Which factors should be raised well above the industry's standard? 4. Eliminate: Which of the factors that the industry takes for granted should be eliminated?</td>
<td>Creativity is enhanced by a number of creativity principles, such as abstracting, reframing and the creation and adaption of tangible prototypes early on.</td>
</tr>
<tr>
<td>The three steps are applied, where the current business model is described, agreed upon, mapped and compared to the competitors.</td>
<td>The design thinking cycle specifically outlines the understanding and reframing of the problem statement/task, which is repeated with every prototype that is developed. The iterative approach enables the team to constantly develop the knowledge base while at the same time testing their learning and pro-gram, which includes the positioning of the firm, its competitors, and future pathways. The team can see the positioning of the firm in comparison to its competitors and identify empty space, which may prove worth exploring.</td>
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The most important visualizations are the developed prototypes, which start as simple paper prototypes and sketches. Sketching is often used to develop and test ideas. Both approaches are inherently ambiguous, leaving room for interpretation, knowledge sharing and creating, and novel idea generation.
| Collaborative Sketching (Shah, et al., 2001; Verstijnen, et al., 1998) | The method is an extension of the method 6-3-5, where designers work on developing graphical representations of solutions to a (design) problem based on the Brainwriting principle consisting of three steps.  
1. Team members independently develop and sketch their proposed solution to the problem for a predetermined length of time. Sketching is the only allowed mode of communication among team members.  
2. At the end of each cycle, the sketch is passed to the next team member. This team member may then add, modify, or delete aspects of the design solution, but the whole sketch cannot be erased.  
3. When everyone has contributed to everyone else’s sketch, a set of solutions will be available, the number of which equals the number of team members. | Creativity is triggered by visual thinking/imagery, provocative stimuli, and flexible problem representation and by the Brainwriting principle of developing ideas alone first before sharing and discussing the ideas, second by sketching itself, and finally through the sketches from team members, which are altered by each team member before the discussion is opened again. “The important role that mental imagery plays in the creative process” (Shah, et al., 2001, p. 9). Those sketches work as provocative stimuli and act as catalysts in developing creative new constructs. | Knowledge is exchanged before the sketching starts to clarify the problem statement or task and after the sketches have been generated and altered and are presented and discussed in the team. Misunderstandings created by the sketches of others lead to the development of novel ideas. Shah and colleagues also suggest that sketches help to establish new relationships between information, leading to new insights about the task. (Shah, et al., 2001, p. 12). The visual elements are the sketches, which are developed individually first and adapted by every team member before they are shared. Sketches are “dense and ambiguous, thus affording reinterpretation of the sketches in many different ways” (Shah, et al., 2001, p. 13). In Collaborative Sketching, the sketches are at the same time co-developed idea prototypes. |

|  |  |  |  |
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| Battelle-Bildmappen Brainwriting  
(VanGundy, 1981, pp. 90-91) | The method combines elements from both Brainstorming and Visual Synectics and is generally considered a Brainwriting variation. The method consists of six steps: 1. A problem statement is read to the team. 2. The team verbally brainstorms to develop known or trivial solutions to the problem. 3. Each team member receives a folder with 8-10 pictures unrelated to the problem. 4. Team members write down new ideas or modification of old ideas individually. 5. All ideas are read to the team. 6. The team discusses the ideas with the goal to develop additional ideas. It is suggested to include an evaluation of ideas after step six. | Both individual idea generation (Brainwriting) and joint idea generation (Brainstorming) facilitate creativity. The most important creativity stimulus is derived from picture stimulation by showing a picture portfolio (“Bildmappen”). | The problem statement/task is read aloud to the team, which then brainstorms to develop already known and “trivial” solutions. Therewith, knowledge is gathered and made visible before creativity is triggered. | Different picture portfolios (8-10 pictures, completely unrelated to the problem) are handed out to each team member to stimulate creativity. The pictures are symbolic and leave room for interpretation and connection with the task of the team. The generated ideas are written down individually before they are shared with the group. No visual artifact is developed. |
| --- | --- | --- | --- | --- |
| Visual Synectics  
(Schlicksupp, 1977; VanGundy, 1981, p. 122-135) | The Visual Synectics process has 7 major stages. In each step, visualizations are used in the form of pictures or visual metaphors. 1. The problem is read to the team. 2. A short analysis of the problem is completed by the team. 3. In the purge step, the team ver- | Analogies and visual metaphors are used to stimulate creativity and develop ideas by “making the familiar strange” to widen the solution space for novel ideas. | Analogies and metaphors are used to analyze the problem statement/task, by “making the strange familiar” to allow the group to view the problem in novel ways. The team shares knowledge in the different viewpoints that are created | Visualizations in the form of pictures, which can have either nothing to do with the problem or are somehow related, are used to stimulate analogy building as well as distancing and abstracting. |
balizes first ideas early to be able to develop better ideas later.
4. Each team member describes the problem as they have understood it using wishful thinking or an analogy. All viewpoints are written down. Finally, one of the viewpoints is selected.
5. In the excursion step, the team takes a holiday from the problem and focuses only on the task at hand, making the familiar unfamiliar through questions and building analogies.
6. Fantasy Force-Fit - the last analogy and the problem as understood are brought together in the most creative way.
7. A new way of looking at the problem is developed that could lead to a solution. The final choice is critical, and careful expert evaluation is suggested.

<table>
<thead>
<tr>
<th>Table 6: Business Model Idea Generation Method</th>
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<tr>
<td>and builds new knowledge by jointly creating new viewpoints and a solution.</td>
</tr>
</tbody>
</table>
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Each idea generation method presented in Table 6 fulfills the three criteria in a specific way. In the following section, the most important differences and similarities are considered and briefly discussed. First, the methods differ in length, execution, and the number of required steps, if redefined steps are required at all. While most methods consist of multiple pre-defined consecutive steps, such as Visual Synectics, Battelle-Bildmappen Brainwriting, and Collaborative Sketching, it is central to Design Thinking to repeat the same step over and over again to develop and test the ideas in the form of tangible prototypes. Further, within the steps, different creativity mechanisms are applied, such as the joint development of ideas in Brainstorming steps or the individual generation of ideas that are shared later on in Brainwriting.

Second, the creativity-enhancing elements are often the same as the visualization or tangibility elements in the methods. For example, sketching appears to be one of the key visualization elements for fostering creativity in the Business Model Canvas and Collaborative Sketching while picture stimulation is applied in Visual Synectics and Battelle-Bildmappen Brainwriting. Regarding Blue Ocean, the method elaborates around a central visual metaphor of aiming to create a blue open ocean of new business opportunities while the team gathers information and ideas in a rather traditional business visualization, a strategy chart.

Third, knowledge and understanding are always supported at the beginning of the idea generation in every method. This phase is also rather explicitly used to create a shared language, such as in the Business Model Innovation Canvas. The Blue Ocean method explicitly facilitates the creation of knowledge by gathering industry and competitor data, which are made accessible by being visualized in the strategy chart that is created by the team. However, as for Collaborative Sketching, the shared understanding occurs in the beginning, when the task is discussed and after the ideas are individually created and altered. The final stage of Collaborative Sketching is the joint description and evaluation of the generated ideas, when misinterpretations facilitate the creation of even more ideas, and one sketch can represent more than just one idea.

Therewith, while all methods fulfill the three identified business model innovation criteria, there are substantial differences in the operation of each method. Two methods have explicitly been tested for the task of business model innovation so far: the Business Model Canvas (Osterwalder & Pigneur, 2010) and Collaborative Sketching in experiments (Eppler, et al., 2011).
2.6. Discussion

Overall, the scanning and analysis of 1369 articles and books has provided a comprehensive overview of potential approaches to idea generation for business model innovation that meet the specific criteria of business model innovation as defined in business model literature. Identifying which idea generation approaches are applicable to the context of business model innovation not only fills an important research gap of interest to researchers and practitioners but opens the field for future research. Identifying requirements for business model innovation as a wicked and ill-defined problem statement has been a first attempt to facilitate the guided selection of methods suitable for a specific task.

This research has provided four contributions to research. First, two literature streams have been combined that so far have not been jointly considered for the identification of business model ideation methods. By analyzing research on idea generation, knowledge from a mature field of research is combined with a still rather young field of research, namely, business model innovation. To answer the research question and gain a better understanding of which methods are suitable for the generation of business model ideas, the field of idea generation provides a rich and well-established set of methods as well as requirements to select methods.

Second, a set of requirements for business model innovation has been identified by analyzing both research fields. To systematically derive idea generation methods for the specific task of business model innovation, the requirements identified in both literature streams have been assessed and combined and are used as a starting point to identify idea generation methods.

Third, six methods have been tentatively identified and suggested to generate novel business model ideas in incumbent firms. Not only is the selection of business model innovation methods important, but systematically applying and testing methods either in experiments, as conducted by Eppler and colleagues (2011), or in in-depth case studies will also enable the refinement of the developed framework and provide valuable insights for both researchers and practitioners. For example, despite the wide application of the business model canvas of Osterwalder and colleagues (2010) in practice, few studies so far have been concerned with the test of suggested methods. Van Gundy’s (1981) suggestion to combine methods that are not per se meeting the re-
uirements for business model ideation might be a promising research avenue. Future research may also continue to examine methodologies far beyond the first idea generation phase of business model innovation.

Fourth, by suggesting a framework to select business model ideation methods, a distinct vocabulary to phrase business model ideation has been suggested. By developing a conceptual vocabulary to describe the very beginning of business model innovation, the developed framework facilitates the selection of idea generation methods and future introduction of whole business model innovation processes. Especially interesting appears the interplay between creativity mechanisms and visualization tools in the idea generation methods. However, not only the framework requires further testing and development; the idea generation methods also require testing and, potentially, combining. VanGundy (1981) has suggested that to tackle complex problem statements, methods may be combined to develop business model ideas.

From a practitioner’s point of view, much research on business model innovation “is concerned with altering business models” (Casadesus-Masanell & Ricart 2010, p. 212); the work of Osterwalder and Pigneur (2010) is an already important starting point. For practitioners, this article may be an initial foundation for the systematic assessment and identification of additional, potentially suitable methods for business model ideation. While a set of requirements for business model innovation is introduced, practitioners may find it especially helpful to distinguish between those requirements that can be tackled with idea generation methods and those that will become more important in the later stages of the business model innovation process, as they are concerned with the whole business model innovation process.

Furthermore, initial guidance is provided for choosing one or more of the six methods that have been identified as suitable for the task of business model idea generation. They are relatively easy to implement and learn in teams, especially for incumbents. Practitioners may also use this research to consider the differences among the six identified methods and rank them based on their firm culture and acceptance of applying sketching, or use them to support a longer idea generation process, such as design thinking – and thus develop their own set of criteria.
2.7. Future Research

This research is subject to several limitations and offers potential for future research. First, while the identified requirements may already build the basis for further research, the requirements also need further refinement, potentially expansion, and testing as well. For example, the role of leadership and experimentation for limiting with the risk associated with business model innovation may be an important additional requirement so far not considered. Leadership (Doz & Kosonen, 2010; IBM, 2009; Wirtz, et al., 2010) and experimentation (Chesbrough, 2010; Doz & Kosonen, 2010; Peterovic, et al., 2001) are especially required to implement business model ideas in incumbents. Doz and Kosonen (2010, p. 371) specify the leadership requirement as one of three meta-capabilities the management team in charge needs to display “as the ability of the top team to make bold, fast decisions, without being bogged down in top-level ‘win-lose’ politics.” The requirements may be tested to determine whether they are both necessary and sufficient. So far, it is assumed that all three requirements are equally important, but further research may show that that one criterion may be more important than the other two, for example.

Second, the development of selection criteria has been based on the idea generation and business model literature in this article and is thus limited to only two research fields. The further development of criteria may support the identification of more sophisticated methods and contribute to the overall research endeavor. For example, the importance of the criteria could be ranked in future research, and it would be helpful to identify further selection criteria. For example, creativity mechanisms have been suggested by Eppler and Pfister (2012) to select creativity methods, which could be compared to and combined with the identified business model requirements.

Third, the methods have only been selected but not tested and compared. Hence, the identification of similarities and differences between the identified methods provides interesting research questions. For example, is there actually a difference regarding both process and outcome that can be identified when testing the methods? First evidence has been provided by Eppler and colleagues (2011) in experiments that suggest that there is indeed a difference between the Business Model Canvas and other idea generation methods, such as brainstorming, when teams develop novel business model ideas. However, clearly more data are needed to rule out biases and other influences,
as well as real-life tests in case studies of incumbent firms to gain a better understanding of idea generation needs for business model innovation.

Fourth, the six methods identified for business model ideation foster knowledge exchange and creation, foster creativity, and apply different visualizations such as symbolic (Battelle-Bildmappen Brainwriting) and schematic visualizations (Business Model Canvas) (Ware, 2012). Future research may focus on the impact of different visualization mechanisms on business model idea generation, as present in the identified methods. So far, it has been argued that imagery and visual thinking encourages idea generation teams to operate at a more abstract level (Cross & Cross, 1996; Shah, et al., 2001; Verstijnen, et al., 1998). To enhance knowledge, research on boundary objects should be considered, which suggests that tangible objects and visualizations acting as boundary objects facilitate knowledge communication, transfer, and creation and are therefore suitable and beneficial for innovation activities (Boland & Tenkasi, 1995; Carlile, 2002; Ewenstein & Whyte, 2009; Fenton, 2007; Fox, 2011; Henderson, 1991; Levina & Vaast, 2005; Star, 1990; Star & Griesemer, 1989).

Fifth, the business model itself is considered a boundary object (Doganova & Eyquem-Renault, 2009), which opens further research avenues. So far, boundary objects research is conducted using mostly ethnographic research (Star & Griesemer, 1989; Sutton & Hargadon, 1996), whereas in idea generation research (Rietzschel, et al., 2006), experiments are predominant, and case studies dominate in business model research (Meehan & Baschera, 2002). To gain the most insights from boundary objects research, it may be most useful to use it as a theoretical framework to analyze idea generation method composition, the idea generation process, and the results, that is, generated ideas in future research.

Finally, the focus of this paper has been solely on the identification of methods for the idea generation phase. This focus may need to be broadened in future research. Comes and Berniker (2008), for example, point out that most firms have sufficient business ideas but lack skills to implement the ideas accordingly, while Demil and Lecocq (2010) argue that business model change is continuous and emerging in nature, which leads research well beyond the initial idea generation as well. Hence, identifying or creating ideation methods that are suitable for the whole business model innovation process is a next promising research step. By building on the requirements identified in
Table 1, researchers may build on the framework developed in this article and create a framework for the whole business model innovation process.

2.8. Conclusion

Business model innovation research has seen a lot of literature reviews early on, mostly focusing on business model building blocks and definitions (Osterwalder et al., 2005; Timmers, 1998). The main goal of this literature review has been to identify suitable methods for the wicked task of business model idea generation in two literature streams: business model innovation literature and idea generation literature. While idea generation literature is a mature research field, business model innovation research is still developing. The methods mentioned in business model research do not build upon research conducted in the field of idea generation research so far, where multiple methods have been analyzed in depth according to their practicality, their effects on teams and individuals, their specific characteristics in enhancing either creativity or logical thinking, or a combination of all three. By combining the two literature streams, a first overview is presented on methods in both fields, and a framework is developed to facilitate the informed selection of methods for the generation of business model ideas (Girotra et al., 2010; Rietzschel et al., 2010).

To answer the research question, this literature review has also shown what is known already; including what methods are suggested for either business model innovation or idea generation in the respective literature streams and which requirements have been identified for business model innovation. The literature review has built new knowledge by identifying which requirements are specifically targeted at the idea generation of new business models and therewith developing a framework to enable the selection of business model idea generation methods for the wicked task. Three criteria have been formed and used to create a framework to refine the list of methods derived from both literature streams. As a result, the literature review identifies six methods as most suitable for the generation of ideas for wicked, ill-defined problem statements. Therewith, a link between two literature streams has been established. The methods all support creativity, foster joined understanding and knowledge creation, and rely on some form of visualization and tangibility to develop ideas. Finally, this literature review suggests boundary objects as a theoretical basis for future research and has noted future research avenues, including the identification of additional criteria from other...
fields of literature and the rigorous testing and comparison of the six identified methods in experiments, as well as in case studies.

The overview presented in this paper offers first insights into a very complex process. For example, the review of idea generation literature highlights multiple methods, which, to some degree, have already been suggested for business model innovation such as analogy building (Frankenberger et al., 2012). Basically all idea generation methods should be highly promising but have not yet been systematically applied and tested for business model innovation. This article does not suggest that business model innovation is a simple, single-step process that requires idea generation alone. Knowing that the complexity of the task requires a potentially more integrated approach toward developing new business model ideas, especially for established firms, this research represents a starting point.

2.9. References


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New Business Models through Collaborative Idea Generation

Martin J. Eppler, Friederike Hoffmann, and Sabrina Bresciani

Abstract

Generating novel and sustainable business model ideas is a crucial yet challenging innovation task. A growing body of literature shows that artifacts, such as visual templates, objects and sketches, can enhance team collaboration and creativity in innovation activities. Drawing on literature from diverse fields we propose a model that aims to explain how artifacts can affect the team processes in developing new business model ideas, positing that they have an impact on creativity and collaboration. We report the results of an illustrative experimental study comparing the team processes of managers working on a business model innovation task. Teams were supported by different types of artifacts (a business model template; physical objects with sketching; or PowerPoint). The results indicate that using the template significantly increases perceived collaboration and decreases perceived creativity, hence showing that artifacts can have the power to shape team work for innovation tasks.

Keywords: Business model innovation; idea generation; collaboration; creativity; team management; innovation tools; artifacts.

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3.1. Introduction

Generating innovative and sustainable business models is one of today’s most challenging tasks for management teams (Chesbrough, 2006; Christensen & Overdorf, 2000) and at the same time continuing business model innovation is a key source of competitive advantage (Mitchell & Bruckner Coles, 2003, 2004). This study focuses on the idea generation phase as the first crucial step towards developing a new business model. Idea generation requires effective team collaboration (Briggs et al., 2003; Garfield et al., 2001; Macrtrimmon & Wagner, 1994) for an appropriate integration of knowledge from different divisions within the firm and to meet the complexity of the task (Fay et al., 2006). Idea generation methods facilitate collaboration (Rietzschel et al., 2006; Sutton & Hargadon, 1996), knowledge exchange (Chen, 1999) and creativity (Girotra et al., 2010; Toubia, 2006) in teams, which are crucial issues for complex and ill-defined problems, one of which is business model innovation (Auer & Follack, 2002). However, so far research has not addressed which idea generation methods are most suitable for business model innovation. One method is specifically designed for business model innovation: the business model template developed by Osterwalder and Pigneur (2010), which has not yet been systematically tested.

Markides (2006) differentiates between business model and product or service innovation, as the generation of new business models does not include the development of new products or services: “Business-model innovation is the discovery of a fundamentally different business model in an existing business” (Markides, 2006, p. 20). Research on idea generation has long recognized the importance of the nature of the task on team performance (Straus & McGrath, 1994, p. 88).

The task of developing new business model ideas is recognized as especially complex (Chesbrough, 2010; Doganova & Eyquem-Renault, 2009), as business model idea generation requires the innovation team to consider and understand various and potentially conflicting positions of the stakeholders and units affected. In addition to the general requirements of idea generation tasks, such as collaboration facilitation, knowledge exchange and enhancing creativity, two specific requirements and supporting conditions have been identified in the business model literature for the business model innovation task. First, generating new business model ideas is argued to require and be facilitated by providing structure and guidance to frame and focus
thought (Brown et al., 1998; Connolly et al., 1993; Hoegl et al., 2008; Stroebe et al., 1992). Structure and focus may be provided by artifacts in the form of templates (Henderson, 1991), such as the business model innovation canvas (Osterwalder & Pigneur, 2010). Second, it has been noted that sharing, creating and integrating knowledge across epistemic boundaries (Gavetti & Levinthal, 2000) are required for successful business model idea generation. They may be achieved through an information pooling process (Carlile, 2002; Dougherty, 1992; Peterovic et al., 2001) and from interacting with knowledge sources both inside and outside the team (Harris & Woolley, 2009).

In the specific context of business model innovation, the potential benefits of using artifacts for facilitating innovation have not yet been investigated extensively. The template artifact developed by Osterwalder and Pigneur (2010) is a prominent example of such an artifact that is often used in businesses. It has, however, not been systematically analyzed in terms of its effects on team performance. While the business model itself may be considered an artifact (Kolfschoten et al., 2010), we aim to understand how different artifacts, such as objects, sketches and the business model template, affect collaboration and participation in groups working on the development of business model ideas.

In recent research, the role of artifacts in facilitating group innovation processes has been emphasized (Heracleous & Jacobs, 2005; Jacobs & Heracleous, 2007; Nicolini et al., 2011; Schrage, 2000). Artifacts which are used to support idea generation may range from “mundane office objects to plastiline, to construction toy materials” (Jacobs & Heracleous, 2007, p. 80), but can also be templates and sketches, which are considered helpful tools to structure and focus the group process (Suthers, 2001; Suthers et al., 2007; Tversky, 1977). In this study, we aim to understand how artifacts may support idea generation for business model innovation tasks in groups, by testing idea generation methods which explicitly use artifacts to foster collaboration.

3.2. Generating Business Model Ideas

We consider two streams of literature to frame the problem: the business model innovation literature and the idea generation literature.
The business model innovation literature has focused extensively on business model terminology and components (Magretta, 2002; Osterwalder et al., 2005). More recently, researchers have gone past this issue and focused on strategic innovation opportunities (Teece, 2010), value creation through business model innovation (Yunus et al., 2010), and barriers to business model innovation (Chesbrough, 2010; Doz & Kosonen, 2010; Eppler & Hoffmann, 2011). Barriers to business model innovation are, for example, the dominant logic of the current business model (Chesbrough, 2010), which makes it difficult to develop novel business model ideas. It has been claimed that these challenges can be reduced by providing structure and guidance to frame and focus thought (Brown, et al., 1998; Connolly, et al., 1993; Hoegl, et al., 2008; Stroebe, et al., 1992). However, no assessments have been conducted so far regarding this claim.

There are very few methods for business model innovation that have been proposed in the business model literature, such as for example experimenting with new business model ideas (Chesbrough, 2010; Doz & Kosonen, 2010; McGrath, 2010). A distinct exception is the canvas, or template, developed specifically for the generation of new business model ideas by Osterwalder and Pigneur (2010). The template has gained significant recognition among practitioners and scholars (Chesbrough, 2010), and can be seen as an approach to map and visualize the structure of a business model. A similar visualization and mapping approach was developed by IBM, which is based on the concept of “component business modeling” scholars (Chesbrough, 2010, p. 359). Templates are said to enable firms to simulate various scenarios before committing to specific investments in reality and to have the “virtue of explicitly visualizing the processes underlying a business model” (Chesbrough, 2010, p. 359). Fritscher and Pigneur (2010) started to investigate the relationships between creativity and constraints specifically for business model generation with the very same template in a software prototype. However, as Osterwalder and Pigneur’s (2010) template is more widely used in practice, we empirically investigate their template in comparison with other artifact-based idea generation methods.

Recent research on innovation argues for a participatory approach towards innovative idea generation (Castiaux & Paque, 2009), positing that effective collaboration in multidisciplinary teams enhances the points of view included in the discussion, while overall ensuring that the complexity of the target issue is sufficiently considered (Fay, et al., 2006). The idea generation literature discusses methods for enhancing
collaboration on divergent tasks, such as brainstorming (Aiken et al., 1996; Osborn, 1957). Other methods focus on the use of objects for meeting facilitation, as for instance Serious Play, which has been found to support both abstracting and constructing novel ideas in complex environments (Heracleous & Jacobs, 2005; Schrage, 2000). Sketching is considered to foster collaboration, communication, and building upon ideas (Shah et al., 2001; Van der Lugt, 2002). To support the idea generation process, previous research has shown that formal constraints and guiding of the collaborative process, for example with templates, improves the effectiveness (SunWolf & Seibold, 1999) while equalizing participation (Okhuysen & Eisenhardt, 2002).

3.3. Artifacts as Boundary Objects

This study aims at contributing to the innovation and business model innovation literature by proposing to study the effect of artifacts for supporting teams working on innovation tasks. In particular, we focus on collaboration and creativity for the generation of innovative business models by testing different methods for business model idea generation. Our research question is: How do artifacts affect the dynamics of teams working on the development of sustainable new business model ideas?

The theoretical basis of our contribution is the boundary objects framework (Carlile, 2002; Star, 1989; Star & Griesemer, 1989). Boundary objects allow members of different groups to attribute different meanings particular to their needs from the same material, while cognition is distributed through verbal and non-verbal means, for example through interactions with sketches and drawings (Lawson, 2006). Recent findings suggest that boundary objects are involved in innovation activities, such as product development (Whyte et al., 2008). Examples for boundary objects are sketches and drawings (Henderson, 1991; Star & Griesemer, 1989), which enhance teamwork and knowledge development (Engeström & Blackler, 2005; Whyte, et al., 2008), as well as both communication and creativity (Henderson, 1991). Boundary objects can be formal presentations, which are often visual representations (Ewenstein & Whyte, 2007, p. 693; Hales & Tidd, 2009, p. 554), such as the business model canvas (Osterwalder & Pigneur, 2010). Ewenstein and Whyte (2007) mention that changing visual materials and representations, such as sketches, act as boundary objects which advance design projects by facilitating interactions in the team. Hales and Tidd (2009) support these findings and argue for the influence of non-formal representations,
which are developed from routines of collaboration in firms. Furthermore, recent research by Doganova and Eyquem-Renault (2009) suggests that business models themselves act as boundary objects, as they are “moving around various actors and coordinating their action” (Doganova and Eyquem-Renault, 2009:1560). Hence, we are interested in understanding how boundary objects in the form of artifacts — such as different objects, templates and sketches — can enhance collaboration and creativity in innovation tasks.

3.4. Research Model and Execution of the Study

We propose a model of the effects of artifacts on team processes in developing new business model ideas. We posit that artifacts have a positive impact on team collaboration, creativity and on the decision to adopt the developed business model idea (Figure 1). To illustrate the application of the model, we conduct an experimental study where we compare the collaboration and creativity of teams working with different artifacts. The subjects are asked to develop an innovative business model for a specific industry. We implement three conditions, providing teams with: (1) A PowerPoint slide (as control condition, emulating a typical business setting), (2) Physical objects (Heracleous & Jacobs, 2005; Schrage, 2000) in combination with sketching (Van der Lugt, 2002), and (3) A template specifically developed for business model innovation (Osterwalder & Pigneur, 2010).

In the following, we motivate the individual hypotheses of our proposed model, which posit that the artifact used by a group for facilitating business model innovation, affects collaboration (Kickul & Neumann, 2000; Stevens & Campion, 1994), creativity (Girotra, et al., 2010) and the adoption of the proposed business model.
Collaboration is defined accordingly to Stevens and Campion using the Knowledge, Skill, and Ability (KSA) scale (Stevens & Campion, 1994), which distinguishes different facets of interpersonal requirements for team collaboration including conflict resolution and collaborative problem solving. Following Stevens and Campion scale (1994), we focus on the individual rather than the team level when analyzing the team process. Hence we propose the following hypotheses:

Hypothesis 1: Facilitating business model innovation with artifacts, compared to a control condition without artifacts, has a positive impact on collaboration.
Hypothesis 1a: Facilitating business model innovation with artifacts, compared to a control condition without artifacts, has a positive impact on conflict resolution.
Hypothesis 1b: Facilitating business model innovation with artifacts, compared to a control condition without artifacts, has a positive impact on collaborative problem solving.

It has been proposed that boundary objects enhance not only collaboration but also creativity (Henderson, 1991; Star & Griesemer, 1989). Warr and O’Neill (2007) found that creativity tools support the “creation, dissemination and refinement of boundary objects” (Warr & O’Neill, 2007, p. 128), following research conducted by Fischer (1999). Stenfors and colleagues (2004) elaborate on the enabling mechanisms of
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artifacts for social creativity by following research of Bennis and Biederman (1977). Hence, we posit that:

Hypothesis 2: Facilitating business model innovation with artifacts, compared to a control condition without artifacts, has a positive impact on creativity.

Finally, the adoption of the developed business idea is included in the model in order to test for the confidence of participants in their developed ideas. Specifically, we aim to understand if the use of artifacts affects the confidence in the business model ideas developed. This leads to the hypothesis that:

Hypothesis 3: Facilitating business model innovation with artifacts, compared to a control condition without artifacts, has a positive impact on the team members’ willingness to adopt the created business model.

We assume that different types of artifacts (i.e., templates, sketches, and toy and office objects) have a different impact on group work processes by enabling specific collaboration patterns. However, the literature does not provide indications for predicting how they might affect group work differently. To investigate the appropriateness of the proposed model, we conduct an experimental pilot study with illustrative aim. We compare groups of managers using different artifacts for generating new business models and measure their perceived collaboration, perceived creativity and willingness to adopt the business model idea that they have developed.

3.4.1. Experimental Treatments

The subjects are 45 experienced managers from Switzerland, working in groups of five under one of three conditions. We provided a realistic task from a well-known industry for the experiment: All groups are asked to develop an innovative business model for the daily newspaper industry. The setting can be considered fairly realistic, as it is rather common that managers from different divisions in a firm are required to work together in ad-hoc teams on complex topics. All subjects are given the same instructions explaining the task. Subjects are randomly assigned to groups and conditions, and they work in separate rooms. An instructor introduces the groups to the idea generation support they are assigned to, and asks them to select a facilitator. The same instructor presents the task to the different groups. The groups are then given two
hours to complete the task, after which they are administered a questionnaire to collect the outcome variables from the research model, as well as demographic data.

The experiment has three conditions: (1) A control condition where subjects use an empty PowerPoint slide to collect ideas, (2) A treatment condition with toy and office supply objects, which act as stimuli (Heracleous & Jacobs, 2005; Schrage, 2000) in combination with sketching with chalks (Van der Lugt, 2002) (see Figures. 2 and 3), and (3) A treatment condition with a business model template (Osterwalder and Pigneur, 2010) in a mapping software environment (see Figure 4).

Figure 2 Office and Toy Objects

Figure 3: Examples of Early Sketches

We have selected these conditions as they represent a wide spectrum of approaches for business model idea generation. The use of PowerPoint as an idea gathering method represents a traditional ad-hoc documentation method used in firms. Therefore, we used Power-Point supported idea generation to match the status-quo in firms and use this condition as our control condition. The participants brainstormed new business model ideas and the facilitator kept track of the ideas on an (initially) empty PowerPoint slide.
Figure 4: Business Model Innovation Template (Osterwalder & Pigneur 2009: 44)

Operationally, we measure the dependent variable of collaboration by asking the subjects to evaluate their perceived collaboration during the group work by answering a written questionnaire. We use an abridged version of the KSA scale (Stevens & Campion, 1994) which was further validated by Kickul and Neumann (2000).

We measure creativity with a self-developed scale to assess participants’ perceptions based on creativity research. Measurements for creativity are classified into ten categories, one of which is self-reported creative activities and achievements (Fleenor & Taylor, 2004; Hocevar, 1981). We are interested in understanding the process of idea generation with methods relying on artifacts, and ask participants directly how they perceived the idea generation process when using their specific artifacts. Thus we developed a scale with the following four items: “I think our business model idea is an innovation”, “My imagination was fostered during the group work”, “My curiosity was triggered by the task” and “We solved the task in a creative way.” The first question contributes to the understanding of the degree of novelty, while the remaining three questions concern the perceived creativity. We measured all items using seven-point Likert scales ranging from “strongly disagree” to “strongly agree.”

To measure the last variable of the model, that is the willingness to adopt the developed idea, we ask the following question: “As head of a daily newspaper would you actually go ahead with implementing this new business model?” In addition, we measured a number of control variables including prior knowledge about business model innovation and the facilitator’s effectiveness.
3.5. Findings

The results indicate that using the business model innovation template (Osterwalder and Pigneur, 2010) in a software environment, compared to a traditional setting, has both positive and negative implications for the group processes. In particular, the template significantly enhances perceived collaboration, while significantly lowering the perceived creativity and the willingness to adopt the business model generated. Employing objects in combination with sketches (Heracleous & Jacobs, 2005; Schrage, 2000) for facilitating business model innovation does not provide differences in the perceived process dynamics compared to the control condition.

To analyze the results of the experiment, we first test the scales by conducting a principal components analysis: the results show that the items load on the expected factors. The reliability analysis of the scale is also satisfactory: the Cronbach alpha for the shortened KSA scale is 0.781 (4 items), Cronbach alpha for the creativity scale is 0.793 (4 items). Having established the reliability of our measurement instrument, we analyze the research model by comparing the means of the experimental groups, as in Table 1 (Standard Deviation in parentheses).

<table>
<thead>
<tr>
<th>Measures</th>
<th>(1) Control</th>
<th>(2) Objects and Sketches</th>
<th>(3) Template</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration (KSA total)</td>
<td>5.21 (.92)</td>
<td>4.95 (1.15)</td>
<td>5.91 (.74)</td>
</tr>
<tr>
<td>KSA Conflict Resolution</td>
<td>5.00 1.43)</td>
<td>4.58 (1.44)</td>
<td>5.79 (.83)</td>
</tr>
<tr>
<td>KSA Collective Problem Solving</td>
<td>5.37 (.70)</td>
<td>5.33 (1.11)</td>
<td>6.04 (.72)</td>
</tr>
<tr>
<td>Perceived Creativity</td>
<td>4.90 (.91)</td>
<td>5.14 (.71)</td>
<td>3.95 (1.04)</td>
</tr>
<tr>
<td>Business Model Adoption</td>
<td>.95 (.22)</td>
<td>1.00 (.00)</td>
<td>.44 (.52)</td>
</tr>
</tbody>
</table>

Table 1: Mean Comparison
We have conducted an analysis of variance (ANOVA) for having an indication of relevance of the differences observed in the mean comparison (Table 2). As we have three experimental conditions and we aim to understand the role of artifacts in comparison to the control condition, we also conducted planned comparisons (Tables 2–3).

<table>
<thead>
<tr>
<th></th>
<th>Collaboration (KSA)</th>
<th>p</th>
<th>Creativity</th>
<th>p</th>
<th>Business Model Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANOVA</strong></td>
<td>F= 3.348</td>
<td></td>
<td>F= 5.454</td>
<td></td>
<td>Chi²=15.6 07</td>
</tr>
<tr>
<td><strong>Objects vs. Control</strong></td>
<td>t= -.719</td>
<td>.476</td>
<td>t =.753</td>
<td>.456</td>
<td>.431</td>
</tr>
<tr>
<td><strong>Template vs. Control</strong></td>
<td>t= 2.014</td>
<td>.051</td>
<td>t =-2.742</td>
<td>.009*</td>
<td>.002*</td>
</tr>
<tr>
<td><strong>Template vs. Objects</strong></td>
<td>t= 2.468</td>
<td>.018*</td>
<td>t =-3.122</td>
<td>.003*</td>
<td>.003*</td>
</tr>
</tbody>
</table>

**Table 2: ANOVA and Planned Comparison Results**

Specifically, we compared the objects to the control condition (“Objects vs. control”), the template to the control condition (“Template vs. control”) and the two treatment conditions (“Template vs. objects”). We flagged all results significant at p < .05 level (two-tailed). Yet the significance testing is conducted with illustrative aim, due to the limited number of subjects, rather than with the purpose of generalization.

The reported results indicate that **hypothesis 1** is supported by the data: subjects who use artifacts for facilitating their group work perceive their collaboration as significantly higher than groups in the control condition (p = .045). In particular, groups using the interactive template perceive themselves as significantly more collaborative than groups who used the toy and office artifacts (p = .018).

There is no difference in the perceived collaboration between groups using toy objects or PowerPoint (p = .476).

For **hypothesis 1a** on perceived confrontation avoidance (a facet of the KSA scale) the results are approaching significance. Hence, we need to reject the hypothesis (p = .079) but also note that subjects using the template report to have avoided confrontation significantly more than subjects using objects (p = .028). Again, we
find no difference in confrontation avoidance for subjects using the objects compared to subjects in the control condition.

<table>
<thead>
<tr>
<th>Measures</th>
<th>KSA perceived confrontation avoidance facet</th>
<th>p</th>
<th>KSA perceived collaborative problem solving facet</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANOVA</td>
<td>F = 2.700</td>
<td>.079</td>
<td>F = 2.682</td>
<td>.081</td>
</tr>
<tr>
<td>Object vs. Control</td>
<td>t = -.869</td>
<td>.390</td>
<td>t = -.166</td>
<td>.869</td>
</tr>
<tr>
<td>Template vs. Control</td>
<td>t = 1.651</td>
<td>.107</td>
<td>t = 2.077</td>
<td>.044*</td>
</tr>
<tr>
<td>Template vs. Objects</td>
<td>t = 2.276</td>
<td>.028*</td>
<td>t = 1.986</td>
<td>.054*</td>
</tr>
</tbody>
</table>

Table 3: ANOVA and Planned Comparison Results for KSA Scale facets*
Indicates results significant at <.05 level; ** indicates results significant at <.01 level.

A similar pattern is found for hypothesis 1b, regarding the collaborative problem solving facet of the KSA scale. The results are only approaching significance, hence the hypothesis is not supported (p = 0.081). We find a significant difference between subjects using the template, which report higher collaborative problem solving, compared to the control condition (p = 0.044).

Hypothesis 2 is not confirmed, although the results indicate a significant difference (p = 0.008) between the perceived creativity of subjects using artifacts compared to the control condition. In fact, the results are significant, but in the opposite direction of our predictions. Subjects who use the interactive template perceive themselves as significantly less creative than subjects who used either the objects or PowerPoint.

Finally, hypothesis 3 follows the same pattern: subjects who use the template are significantly less likely to adopt the business model idea they developed, compared to the subjects in the control condition (p = 0.002) and subjects who used toy objects (p = 0.003).

In conclusion, contrasting the two treatment conditions, we find a clear but surprising pattern: different types of artifacts can lead to very different group dynamics. We find that the condition with objects and sketches does not lead to different results than the control condition. This is possibly due to the individualistic choice of toy objects and the drawing of sketches (Heracleous & Jacobs, 2008).
Conversely, the template has a significant positive impact on perceived collaboration, thus serving as a joint boundary object that acts as a collaboration catalyst, as predicted by theory, and a significant negative impact on perceived creativity and business model adoption.

We have tested the effect of control variables (ANCOVA), including demographic data, the facilitator skills (as assessed by the group participants) and the previous knowledge on the topic of business model development, and we do not find evidence of heterogeneity in the results.

3.6. Contribution

3.6.1. Theoretical Implications

In this study we propose a model to capture relevant dimensions of the effects of artifacts for supporting collaborative business model innovation. We illustrate its application and find that artifacts can have an impact on creativity and collaboration. Facilitating business model innovation teamwork with the template (within a software environment) improves perceived collaboration, supports cautiousness regarding the implementation of the generated ideas and decreases perceived creativity, compared to the control condition. We can assume that this difference is caused by the rather fixed structure of the template. Teams working with the template have detailed information on the business model elements visualized; however, those teams are also relatively fixed and forced to think “within” the given domains of the template. These findings resonate with the concepts of bounded creativity (Brown & Cagan, 1996). Formal constraints and guidance of the collaborative process are useful for improving effectiveness (SunWolf & Seibold, 1999) and fostering participation (Okhuysen & Eisenhardt, 2002).

Teams using objects in combination with sketching find their collaboration more creative, as the switch between different visual work modes (configurating, storytelling and sketching) allows for both distancing and abstracting (Doz & Kosonen, 2010). The study further adds to the boundary object literature and shows that artifacts are powerful tools for facilitating team knowledge work, that deserve to be addressed in more depth by the academic community. Our results also show that different types of objects have varied effects, which are here conceived as affordances (Gibson, 1977, 1979). Research on Serious Play suggests that rich imagery and stories are triggered with objects, which creates “a sense of involvement and ownership that
not only facilitates effective team building [...]” (Jacobs and Heracleous, 2007:79). This is in line with our findings, which show that teams using objects and sketches are more confident in adopting the developed ideas. One central characteristic of boundary objects is their flexibility (Nicolini, et al., 2011), while the template represents a rather fixed format. The degree of flexibility could explain why the objects and sketches fostered creativity more than the fixed template. Another aspect fostered by boundary objects is perspective taking (Boland & Tenkasi, 1995), which is especially enabled by the arrangement of objects and the sketching of situations, but not necessarily when using the template alone.

Jacobs and Heracleous (2007) found that the provision of context with those objects is beneficial for idea generation discussions, which often bring up critical issues and debate. Those issues are “concretizing [...] into embodied metaphors” (Jacobs and Heracleous, 2007:79). Our findings suggest that the template supports confrontation avoidance better than the objects in combination with sketches; however, this finding should be supported with more experimental or case study evidence.

Future research may build a profile of the effects of artifacts on group dynamics. It seems important to include further contextual factors in the analysis of creativity at work, or employee creativity, such as the work environment, as pointed out by Dul and Ceylan (2011).

### 3.6.2. Practical Implications

Our results suggest that organizations may benefit from employing the template developed by Osterwalder and Pigneur (2010) for business model idea generation to foster collaboration in teams. The template, used in a software environment as in the here presented experiment, could also be used to facilitate remote teams, with subjects interacting from different locations. The proposed theoretical model can be used by practitioners and consultants to classify tools and artifacts used to support innovation and group knowledge work. It can help to guide decisions on the selection of artifacts for enhancing different aspects of group work, such as collaboration or creativity.

In general, the use of artifacts as stimuli for improving collaboration quality could be applied to various organizational knowledge tasks. In particular visual templates appear to improve group collaboration in brainstorming sessions on complex and abstract tasks such as generating new business model ideas.
Nevertheless, this study shows that artifacts can have both positive and negative effects. A highly structured or formalized template can lead to a low perceived creativity because it constraints thoughts. One could thus tentatively advocate a combination of creativity triggering methods, such as different artifacts, with more structured methods, such as templates, to find novel business model ideas.

3.7. Conclusion

This study proves that artifacts can have considerable power in shaping group interactions and idea generation in the context of business model innovation. Business model innovation is a crucial task for existing firms, as firms need to be able to adapt to environmental changes in a flexible manner and foster innovation pro-actively. Our study sheds some light on the phenomenon of artifact-mediated interactions, showing that using visual artifacts, in the form of an interactive template, increases the perceived collaboration while decreasing the perceived creativity. These significant and somewhat surprising results point toward the need to investigate the role of artifacts on knowledge work and innovation in organizations in more detail.

Future research should focus on the nature of the visual artifact used to facilitate business model idea generation, as research has pointed towards the differences between fluid and frozen material in visual practices (Whyte et al., 2007). Further studies should focus on comparing perceived to objective process creativity, and the resulting quality of the outcome, to test if the perceptions correspond to the actual, objective performances (Ariely, 2009). Hence both perceived and expert rating for creative activities should be measures in future studies (Amabile et al., 1996; Amabile, 1983, 1988, 1996). Although we recognize that more research is needed to provide detailed guidelines for practitioners as well as for the generalization of the findings, this pilot study provides a contribution to stimulate further research in the area, by showing that artifacts have the potential to significantly affect collaborative and creative processes and their perception by team members.
3.8. References


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Chapter 4

Business Model Ideation with Visual Methods

Friederike Hoffmann, Sabrina Bresciani and Martin Eppler

Abstract

To develop novel business model ideas, teams need to ensure efficient and effective communication. However, understanding the current business model and at the same time developing creative and feasible new ideas remains a core challenge for existing firms. We have conducted experiments to provide evidence on how idea generation methods differ in their support for teams aiming to develop novel business model ideas. Specifically, we aim to understand how different forms of visualization structure business model ideation. The results from our initial experiments suggest that methods differ; however, while group members are equally satisfied with the generated results, they are less satisfied with the process when more structure is imposed by the idea generation method.

Keywords: Business model innovation, idea generation, communication, knowledge sharing, knowledge creation, visual methods

An earlier version of this article has been presented at the 2012 EURAM conference in Rotterdam, Netherlands, and at the 2012 ISPIM conference in Barcelona, Spain.
4.1. Introduction

Recent research has started to examine how new business model ideas are developed and how different methods may support the difficult task of generating novel business model ideas in incumbent firms (Eppler et al., 2011). In fast changing environments, ideas do not come “naturally” from either customers or research and development departments (Coates et al., 1996; Rochford, 1991) but need to be developed intentionally and systematically, for example in idea generation sessions. The business model innovation canvas (Osterwalder & Pigneur, 2010) is the most prominent method to generate business model ideas.

In order to develop new business models, communication and knowledge exchange and creation among team members are essential. Doz and Kosenen (2010, p. 376) argue that “dialoguing,” which is “surfacing and sharing assumptions, understanding contexts,” is important for the development of new business models. Osterwalder and Pigneur (2010, p. 148) posit that communication, as well as understanding, dialogue, and exploration, are supported by visual thinking, which is facilitated by the business model canvas. Research on knowledge creation positions “strategic conversations” as the center of attention; that is, “a conversation oriented towards the advancement of the company, focused on the creation of future business” (Mengis & Eppler, 2008, p. 1291). As the roots of business model innovation research can be found in strategy research (Zott & Amit, 2008), among others, we argue that strategic conversations are the basis for developing novel business model ideas in firms. To enable knowledge exchange and creation to advance firms by engaging in strategic conversations, researchers have argued for imposing context-specific guiding principles (Harkins, 1999; von Krogh & Roos, 1995). Guiding principles, however, are found in various forms in idea generation methods that structure knowledge exchange and creation. Some of the guiding principles are visualizations, which are the focus of interest in this research endeavor, because the role of knowledge visualizations appears essential when knowledge is shared and created in teams (Eppler & Burkhard, 2007).

Idea generation research has focused on understanding differences between individual and group idea generation (Brown et al., 1998) and on electronic versus face-to-face idea generation in groups (Girotra et al., 2010). Shah and colleagues (2003, p. 113) point out: “Despite several claims and much anecdotal evidence about the usefulness
of these methods, little formal experimental evidence exists currently to indicate that these methods are effective… Further, the rules and procedures for these methods seem to have been specified arbitrarily, regardless of the nature of the problem being solved. We need metrics to experimentally evaluate the effectiveness of these methods for different kinds of design problems.” As suggested by Shah and colleagues (2000), most idea generation method tests are conducted through experiments to evaluate different methods. While it is important to understand which methods are suitable to generate novel business model ideas, it is also important to understand the fine differences, especially regarding knowledge sharing and creation. This research is motivated by the following research question: *How do idea generation methods differ in regard to their support for knowledge communication?*

To answer our research question, we build on the studies of Shah and colleagues (2000) and examine two visual idea generation methods suitable for the generation of business model idea generation in teams. In the following sections, we first review business model innovation and idea generation research with a focus on team communication that enables knowledge exchange and creation. In the measures section, we motivate the scales we use in this study; we then describe the research design of an illustrative experiment that we have conducted to evaluate two visual methods. Based on this data set, we elaborate on the benefits and shortfalls of the two idea generation methods for the specific context of business model innovation, compared with a control condition. Specifically, we find that groups that worked with visual idea generation methods were less satisfied with the process but equally satisfied with the generated results. In the final sections, we discuss implications for existing research on idea generation and business model innovation, the limitations of our research, and opportunities for further research before concluding the paper.

### 4.2. Literature Review

In this section, we review business model innovation and idea generation research to motivate our research question and to ground our empirical study in existing literature. We position the concept of business model innovation in the literature on idea generation. We argue that the role of knowledge sharing and creation is essential for the development of novel business model ideas and needs to be reflected in the idea generation methods used.
4.2.1. Business Model Innovation Task

Generating new business models is one of today's most challenging tasks for management teams (Chesbrough, 2006; Christensen & Overdorf, 2000) since the need for a new business model often arises out of a major disruption or serious crisis of a firm and its current business model, which threatens its survival in a changing market (Johnson et al., 2008; Meehan & Baschera, 2002). The first step in developing new business models is to generate a variety of new ideas (Girotra, et al., 2010; Rietzschel, Nijstad, & Stroebe, 2010). Developing business model ideas is not an individual task. The overall complexity of the task (Auer & Follack, 2002; Doz & Kosonen, 2010; Peterovic et al., 2001), the importance of the issue for the survival of a firm, and the insecurity of the innovation endeavor all require cooperation and teamwork. It has been acknowledged that idea generation tasks are often generated in formal or informal group collaborations (Garfield et al., 2001), which makes idea generation both a cognitive and social process (Dennis et al., 1999; Garfield et al., 2001) of knowledge exchange and creation.

While established and well-examined processes exist in many firms for generating product innovations, the academic community has so far predominantly focused on explaining ex-post how business model innovation is conducted in firms (Johnson, et al., 2008; Meehan & Baschera, 2002). For developing business model ideas, the business model canvas (Osterwalder & Pigneur, 2010) has been proposed and applied throughout in practice. The canvas visualizes nine building blocks, or components, of any given business model in the form of nine linked boxes. Therewith, the canvas allows for the visualization of the current business model as well as the development of new business models without missing any important components.

4.2.2. Idea Generation Research

Idea generation, or ideation, is "the process of generating or conceiving new ideas" (Reinig et al., 2007, p. 114). The goal of idea generation sessions is to create a pool of ideas for further evaluation, refinement, and, ultimately, implementation (Garfield et al., 2001). However, some idea generation methods are argued to also enable teams to select the best idea (Girotra et al., 2010). Idea generation methods, the most widely known one being brainstorming (Osborn, 1957), are applied in various organizational settings, such as meetings, and for different tasks, such as product development. The
research method most often applied by researchers is experiments with students, aiming to compare variants of idea generation methods, such as brainstorming and electronic brainstorming (Silver et al., 1994), and for measuring idea generation effectiveness (Girotra et al., 2010; Shah et al., 2000; Shah et al., 2003).

4.2.3. Idea Generation for Complex and Ill-Defined Problems

Ever since the publication of Osborn’s (1957) influential work "Applied Imagination", dozens of idea generation methods have been developed and proposed to focus and enhance creativity of individuals and groups (VanGundy, 1981). Idea generation is considered a key step in organizational problem-solving (Reinig et al., 2007) and defined as the search process for a solution to a problem (Kavadias & Sommer, 2009). Hence, research argues that idea generation meetings are problem solving group meetings (Van der Lugt, 2002). However, while research on problem solving processes focuses on mostly five distinct phases — problem identification, information search, idea generation, idea evaluation, and selection and implementation (Mumford, & Redmond, 1994) — we follow research on idea generation that focuses solely on idea generation and the selection of the best idea for ill-defined and complex problems. As ill-defined problems rarely have just one possible solution, multiple ideas need to be not only generated but also evaluated and selected. Shah and colleagues (2003) argue that engineering design tasks have specifications that are likely to influence the effectiveness of idea generation methods used for these tasks. We argue that developing business model ideas is another specific task for which certain methods are more effective than others.

The complexity of the problem, or task, has been examined in a couple of studies. Kavadias and Sommer (2009) provide a comprehensive overview and cite studies of Huberman and Loch (1996), who find that higher problem complexity enhances the benefits of collaboration, and of Mihm and colleagues (2003), who find that higher problem complexity is likely to lead to problem-solving oscillations, which is reduced by frequent communication. Idea generation research recognizes different task affordances, such as for new product development (Coates, et al., 1996; Rochford, 1991), for the complexity of the task (Shah et al., 2000), or for knowledge sharing (Paulus, 2000).
4.3. Visual Idea Generation

To enable knowledge exchange and creation, multiple methods might be considered. For this study, we aim to focus on visualization-based methods. For this purpose, we select two widely different visualization methods and compare them to an unsupported control condition. The selected methods are the Business Model Innovation Canvas (Osterwalder & Pigneur, 2010), a designated method to change the business model of a firm, and Collaborative Sketching (Shah et al., 2001), a method well suited to enable knowledge exchange and creation by relaying on sketches. Finally, traditional brainstorming is included in this study to be used as a reference point. In the following, we motivate our selection.

4.3.1. A Static Visualization Method

The one business model idea generation method specifically designed for the task and grounded in the literature is the business model canvas (Osterwalder & Pigneur, 2010). The canvas depicts nine boxes, one for each business model component. The method is thus based on a static visualization of the business model and provides structure for the idea generation. The boxes provide the opportunity to change one of the boxes at a time and align the remaining business model components as necessary, or start with multiple changes. Groups may work with Post-its, sketches, or text written directly on the business model canvas (Osterwalder & Pigneur, 2010). The canvas bases the idea generation on brainstorming; groups develop ideas while presenting ideas to group members. The brainstorming phase is then followed by a discussion and selection phase. The business model canvas is widely recognized in practice, but empirical investigation and comparison has just begun (Fritscher & Pigneur, 2010).

4.3.2. A Dynamic Visualization Method

We screen idea generation methods for those suited for complex, ill-defined problem solving, while at the same time facilitating knowledge exchange and creation (Shah, et al., 2000; Shah et al., 2001). Collaborative sketching, or C-Sketch, has been explicitly recommended for complex and ill-defined problem solving, for example in engineering design (Shah, et al., 2001). Furthermore, sketches have a longstanding tradition in idea generation and refinement in both design and engineering. Sketching,
a dynamic form of visualization, has three main aspects that are beneficial for idea generation in groups: (1) support of re-interpretative cycles in individual thinking and group thinking processes (Van der Lugt, 2002); (2) facilitation of communication by allowing for a range of interpretations of elements and the sketch as a whole, which leads to focused group discussions (Scrivener & Clark, 1994); and (3) knowledge creation, sharing, and communication (Pfister & Eppler, 2012).

C-Sketch is based on the brainwriting principle, that is, group members develop sketches of their ideas alone and circle the sketches without exchanging words. Group members develop at least one idea and contribute to every single idea of their team members without exchanging words. After every group member has contributed to the sketches, the ideas are discussed (Shah et al., 2001). C-Sketch differs from Brainsketching, where group member are allowed to discuss each sketch before having the next person work on the sketch (Van der Lugt, 2002). C-Sketch has been found to increase creativity and flexibility while at the same time facilitating complex group processes based on its structured proceeding (Shah et al., 2001).

4.3.3. Brainstorming

Finally, Brainstorming is included, as it is the most commonly known and investigated idea generation method (Osborn, 1957; VanGundy, 1981). Furthermore, Brainstorming is one of the most popular idea generation methods used by organizations (Faure, 2004). Brainstorming is conducted in groups where individuals are asked to generate as many ideas as possible in a certain time frame on a fixed topic or task by following brainstorming rules (Osborn, 1957). Those rules are as follows: the more ideas the better, the wilder the ideas the better, improve or combine ideas already suggested, and do not be critical (Diehl & Stroebe, 1987). Ideas are written on Post-its, for example, and pinned on a wall or flipchart for everyone to see. Hence, brainstorming groups have no time for individual idea generation, but after the initial idea generation phase, ideas are often jointly grouped into categories and selected. Brainstorming is used as a control in this study, with the two other methods being tested and compared to the method.
4.4. Research Model

4.4.1. Method Comparison

In this study, we are interested in understanding how visualizations facilitate communication in business model innovation teams.

<table>
<thead>
<tr>
<th>Method &amp; Basic Principle</th>
<th>Tackles</th>
<th>Promotes</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Sketching: Brainwriting</td>
<td>A) Provocative stimuli B) Incubation C) Use of analogies and metaphors</td>
<td>A) Visual imagery &amp; sketching B) Feedback C) Combinatorial play</td>
<td>(Kulkarni, 2000) (Shah et al., 2001)</td>
</tr>
<tr>
<td>Brainstorming</td>
<td>A) Provocative stimuli, B) Early judgment</td>
<td>A) Emphasis on quantity B) Use of analogies</td>
<td>(Kulkarni, 2000) (Shah et al., 2001)</td>
</tr>
</tbody>
</table>

Table 1: Idea Generation Method Overview

To understand the role of visualization techniques for the process of idea generation, the selected methods need to be different enough but also similar in some aspects, such as in their design (Shah et al., 2000). Both C-Sketch and the business model canvas foster the creation of a visual representation of business model ideas: the former using sketches only, the latter in the form of a structured diagram, which may or may not include sketches. Both methods support comparable processes, including idea generation, discussion and selection of the best idea. However, the two methods also differ significantly. The business model canvas might be used to support simply brainstorming or adding ideas to one of the nine sections of the canvas, whereas C-Sketch relies on the brainwriting principle, and group members generate ideas alone first before discussing their ideas.

4.4.2. Measures

The main goal of idea generation in groups is to develop ideas that solve a problem in the best possible way. Reinig (2003, p. 65) argues, for example, that collaborative
group support systems, which are also used to generate ideas in teams, “are often developed to improve the effectiveness and efficiency of teams; however, the satisfaction users have with the processes and outcomes of the teamwork itself often determines the ultimate adoption and sustained use of collaborative technologies.” Hence, methods may be abandoned by teams if the idea generation process is perceived as unsatisfactory. The measures suggested are most often subjective measures of individual satisfaction with the outcome and/or process; however, it has been argued that many biases may prevent the results from being correctly interpreted (Paulus, 2000). Therefore, not only subjective but also objective measures need to be combined to assess the overall effectiveness of the tested idea generation methods.

Figure 1: Research Model

The following variables have been identified to understand how groups work with the two different visualization methods and how their knowledge exchange and creation in those strategic conversations differed.

4.4.3. Satisfaction with Process and Results

Extant idea generation research applies two individual satisfaction measures: Satisfaction with process and satisfaction with outcome. Reinig and colleagues (1995) illustrate the importance of process satisfaction and indicate that a low process satisfaction may cause users to abandon GSS (Group Support System) technologies even if performance increased. Connolly and colleagues (1990) examine satisfaction with five distinct satisfaction measures: satisfaction with process, evaluations of ideas generated, willingness to remain in one’s current group, how much fun the process was, as well as overall satisfaction. Reinig (2003) presents a causal model of meeting
satisfaction derived from goal setting theory, and follows Briggs and de Vreede (1997) by distinguishing satisfaction with the meeting outcomes from satisfaction with the meeting process. Both are a function of the degree to which the meeting is perceived to have contributed value through goal attainment. The distinction between outcome and process is necessary according to Reinig (2003), because it is possible that an individual could be satisfied with a meeting outcome and not satisfied with a meeting process, and vice versa. Hence, we utilize the satisfaction with process scale, as developed and validated by Reinig (2003), measured with five questions regarding the efficiency, coordination, fairness, understanding, and overall satisfaction of the problem solving, or idea generation process, and measured with a five-point Likert scale (not at all–totally agree). Reinig (2003) tests the scale using an intellectual ranking task, hypothesizing and confirming a relationship between perceived net goal attainments and meeting satisfaction.

We argue that the visualization inherent in both methods leads to high-quality group discussions, since the canvas provides structure and guidance and C-Sketch facilitates creativity through the use of visual imagery and feedback loops. High-quality discussions, in turn, should lead to overall satisfaction with the idea generation process and its outcome. Thus, we hypothesize:

**Hypothesis 1:** Using either of the visual idea generation methods to develop new business models has a positive impact on satisfaction with the idea generation process compared with the control condition (brainstorming).

Furthermore, as both visual idea generation methods structure the idea generation process, the in-depth discussion of ideas should lead to common understanding and agreement. Therefore, we assume that the attitude toward the generated results is higher in groups working with specific visual outcomes, that is, visual idea prototypes. We thus include the “attitude toward results scale” scale developed by Petrovic and Krickl (1994), consisting of five items, measured on a seven-point Likert scale. Petrovic and Krickl (1994) apply the scale in a study to compare differences in idea generation for computer and traditionally moderated groups. To understand the differences regarding visual idea generation methods and traditional brainstorming, we believe this scale offers important insights.
We therefore hypothesize:

_Hypothesis 2: Using either of the two visual idea generation methods to develop business model ideas has a positive impact on attitude toward results compared with the control condition (brainstorming)._
Hypothesis 3: Using either of the visual idea generation methods to develop business model ideas has a positive impact on structuring group communication compared with the control condition (brainstorming).

4.4.5. Group Work Preference

Finally, a so-called human factor (Shah, et al., 2000) that should be measured in idea generation experiments is group preference, that is, whether a person not only enjoys but sees the benefits in working in groups. We use the scale developed and tested by London (2006) of ten questions on a seven-point Likert scale (strongly disagree–strongly agree).

Regarding group preference, empirical research has so far yielded mixed results. London (2006), for instance, in an experiment involving brainstorming and brainwriting method tests, finds that group preference does not have a significant impact on the effectiveness of either idea generation method. Further, London (2006) bases his research on the work of Larey and Paulus (1999) in his comparison of brainstorming and brainwriting and finds, as opposed to his hypothesis, that group preference does not have an interaction effect on other effectiveness measures of the two methods, such as number of ideas generated. However, London (2006) does find that participants in the brainwriting group’s report that they have been significantly stimulated by other participants and feel their creativity is enhanced. This is to some extent surprising, as the mere time for discussion in brainwriting groups accounts for only a fraction of the time of brainstorming groups. Two of the methods tested here are based on the brainstorming creativity principle: Brainstorming and the Canvas. In contrast, C-Sketch is based on a special form of brainwriting. Sketching is argued to enhance the creativity in the collaborative sketching groups, for example by enhancing ambiguity (Pfister & Eppler, 2012). However, as group preferences, like all other scales, are collected after the group idea generation takes place, we suggest that sketching leads to a better group experience compared with the other two methods and is therefore ranked better.

Hypothesis 4: Groups using either method relying on the brainstorming principle report negative group preference compared with groups using the method relying on the brainwriting principle, which reports positive group work preference.
4.5. Research Design

In this section, we discuss the experimental design and the data collection, and we characterize the sample. Following the indications of Shah and colleagues (2000), we employ an experimental setting. In our study, the independent variable is the idea generation method, and the dependent variables are the measures introduced in the previous section.

4.5.1. Experimental Design

We develop a study comparing three conditions: (1) a control condition in which subjects brainstorm, (2) a treatment condition in which subjects use the idea generation method of collaborative sketching (C-Sketch), and (3) a treatment condition in which subjects use an idea generation method specifically developed for business model innovation, the business model canvas (Osterwalder & Pigneur, 2010).

To provide a realistic task for the experiment, we have selected a topic that was likely to be familiar to participants from any field. We have therefore chosen the context of daily newspapers. We can assume that every manager knows the basic business model of daily newspapers, consisting of advertising and classified revenues in combination with subscription and newspaper stand revenues. Before the actual experimental session, participants were instructed regarding the components of a business model and had both a presentation and short discussion on the newspaper industry and its current challenges. The subjects are randomly assigned to groups of approximately 5 participants, and groups are randomly assigned to experimental conditions. In line with Kramer and colleagues (1997), the setting can be considered fairly realistic, as it is rather common that managers from different divisions in a firm are required to work together in ad hoc teams on complex topics. Random assignment is necessary to average out potential biases, as most of those human variables cannot be explicitly measured and controlled (Shah et al., 2000). All groups are given the same task: “Generate as many business model ideas as possible for a regional daily newspaper and select the best idea.”
4.5.2. Sampling and Data Collection

The participants are graduate students from diverse backgrounds with at least two years of work experience, enrolled in (part-time or full-time) graduate programs at two large European universities. The sample size of this preliminary and ongoing study is 112 respondents, with an almost equal distribution of gender (58 men and 54 women). The participants are clustered in 14 groups (5 groups for each treatment condition and 4 groups for the control condition). They have an average age of 32 years and have worked in a variety of industries. Based on the work of Sutton and Hargardon (1996) and Kavadias and Sommer (2009), we posit that in a corporate environment, multiple participants with expertise would have been assigned to the task.

An instructor introduces the groups to the idea generation support they are assigned to (one of the three conditions) and asks them to designate a facilitator if desired. The same instructor presents the task to the different groups, which work in separate rooms on the same business model innovation task (i.e., innovate the business model of a daily newspaper). The groups are then given two hours to complete the task, after which they are administered a questionnaire to collect subjective outcome variables of satisfaction from the research model, as well as demographic data.

4.6. Empirical Findings

We have measured satisfaction with process and attitude toward results, communication, and group preference with validated scales. Conducting a principal component analysis, we find confirmation that the scales load on separate factors, and the reliability of the scales is satisfactory, above the recommended threshold of 0.7 depicted in Table 2.

<table>
<thead>
<tr>
<th></th>
<th>Reliability (Cronbach Alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with process</td>
<td>0,793</td>
</tr>
<tr>
<td>Group preference</td>
<td>0,776</td>
</tr>
<tr>
<td>Attitude towards results</td>
<td>0,830</td>
</tr>
<tr>
<td>Communication</td>
<td>0,897</td>
</tr>
</tbody>
</table>

Table 2: Reliability (Cronbach Alpha)

Table 3 provides a summary of the means per condition, and Table 4 provides the results of the analysis of variance (ANOVA). We conduct the homogeneity of variance test, and all variables have satisfactory results. We can report a difference between
visual idea generation methods and the control condition without visual support. Hence, employing visual idea generation methods for facilitating business model innovation group work significantly changes the perceived group process, while so far and with the small sample in this study, we can report no difference regarding the attitude toward the achieved results between the visualization groups. Respondents who worked in visually supported groups had significantly lower values for satisfaction with the process for working in groups and for communication. Hence, the postulated hypotheses need to be rejected. However, the results show a clear pattern, as depicted graphically in Figure 2. The trend is consistent for all the measured variables: group members feel less comfortable when using methods that offer more structure and constraints compared with the control condition that offers the most possible freedom of thought and processes. This is an interesting finding; knowing that a task as complex and ill-defined as business model innovation requires structure, group members would still prefer more freedom. However, as all conditions have comparable results regarding the subjects’ attitude toward the results; we consider this a relevant finding, as the visualization forms differ with C-Sketching imposing fewer restrictions, for example. The participants are less satisfied with the process when they are constrained by visual methods, but they are equally satisfied with the results. Yet research shows that for developing ideas for new business models, the guidance offered is necessary to tackle the complexity, while the efficiency is not given in unstructured methods, such as the brainstorming control condition.

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>C-Sketch</th>
<th>Canvas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with process</td>
<td>3,9889</td>
<td>3,7526</td>
<td>3,5362</td>
</tr>
<tr>
<td>Group preference</td>
<td>5,4778</td>
<td>5,1902</td>
<td>4,8915</td>
</tr>
<tr>
<td>Attitude towards results</td>
<td>5,5647</td>
<td>5,3524</td>
<td>5,2809</td>
</tr>
<tr>
<td>Communication</td>
<td>6,2222</td>
<td>6,0362</td>
<td>5,4491</td>
</tr>
</tbody>
</table>

Table 3: Means Comparison

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with process</td>
<td>3,121</td>
<td>.048*</td>
</tr>
<tr>
<td>Group preference</td>
<td>3,804</td>
<td>.025*</td>
</tr>
<tr>
<td>Attitude towards results</td>
<td>.592</td>
<td>.555</td>
</tr>
<tr>
<td>Communication</td>
<td>8,177</td>
<td>.000**</td>
</tr>
</tbody>
</table>

Table 4: ANOVA (* Sig <.05; ** Sig. <.001)
Although some of these results might seem contradictory at first, they bring to the surface the need to measure satisfaction with process and attitude toward results separately. Participants who use new methodologies (treatment groups) might feel frustrated with having to learn novel and more complex techniques, fear failure, and might certainly feel constrained by the methodology imposed; therefore, they may not be as satisfied with the group work process. However, when asked to evaluate the final decision (the outcome of the group work), they appear to realize that both restricting visual idea generation methods are conducive to high quality results. This finding is in line with research on innovation that has shown that constraints lead to more efficient solutions (Gibbert & Scranton, 2009).

![Figure 2: Graphs of the Results. Y axis depicts 7 point Likert scale](image)
Chapter 4

These results provide some preliminary evidence that visual idea generation methods can alter the group process and outcome. We can presume that the “constraints” of the Canvas (related to the concepts of “unevenness” and “useful awkwardness”; Blackwell and colleagues (2001) make the idea generation process less free, but for the same reason, it structures the idea generation and the decision-making process, obliging subjects to make more informed decisions, especially when solving an ill-defined and complex business model innovation task.

4.7. Discussion

This work offers theoretical implications for literature on idea generation and business model innovation, as well as practical implications for managers.

4.7.1. Theoretical Implications

Changes in the competitive environment, such as new regulations or technological change, initiate business model innovation in existing firms (Afuah & Tucci, 2001). Gaining a deeper understanding of which approaches are suitable for the very beginning of business model innovation, namely, the generation of business model ideas, is a crucial challenge (Chesbrough, 2010).

Two visual idea generation methods have been selected, assessed, and compared to a control condition. Although the preliminary results are not yet sufficient to draw conclusions due to the small sample, interesting patterns can already be observed and suggest that different idea generation methods can shape group work dynamics and the results. The main theoretical contribution of this study is the differentiation between structured and unstructured idea generation, which is achieved by different forms of visualizations. The subjective measures used in this study to evaluate both the process and the outcome are a relevant starting point but may not be sufficient; there is evidence that subjects have a biased self-perception of their effectiveness (Girotra et al., 2010).

To effectively share and create knowledge in teams, the visualizations in the two methods structured the communication and knowledge sharing and creation process, therewith providing structure to the whole idea generation process. Further research
should deploy objective measures and elaborate more on the role of *knowledge visualization* as a potentially key success factor. Eppler and Burkhard (2007, p. 112) define knowledge visualization as “the use of visual representations to improve the creation and transfer of knowledge between at least two people.” Strategic conversations (Mengis & Eppler, 2008) should generate business model ideas, structured by the visualizations, but further concepts also may be linked to them, such as sketching (Pfister & Eppler, 2012; Van der Lugt, 2002).

### 4.7.2. Practical Implications

Understanding how idea generation methods facilitate communication and therewith, knowledge sharing and creation to tackle complex and ill-defined problem statements in strategic conversations is a key issue for firms. By applying visual idea generation methods, practitioners can structure and guide an idea generation process that may otherwise be too open to arrive at any conclusion. Understanding how participants perceive the process is helpful to prepare idea generation sessions, such as by supporting the use of most likely unfamiliar visual methods, such as C-Sketch, through specific warm-up sessions and preparations.

Finally, it may be reassuring for practitioners to see that most management employees should be familiar and comfortable using Brainstorming. Team members in our experiment were satisfied with the process and their results. This is a relevant observation; it seems to suggest that subjects are more satisfied with a method they are familiar with, even if the method does not lead to the best outcome. The perception of subjects regarding the effectiveness of methods is thus possibly biased. Further, as Reinig (2003) points out, satisfaction with a task, meeting, or process only occurs if the individual perceives (future) fulfillment of goals. However, commitment to group goals is rather difficult to establish in randomized experimental groups and is thus another limit of the study, due to the employed research method. Hence, the familiarity of brainstorming may be used to open the door for the introduction of further, more sophisticated methods in firms that are useful for complex and ill-defined tasks that cannot simply be solved in a brainstorming session.
4.7.3. Limitations and Suggestions for Further Research

The research design is subject to common limitations of experimental methods, which includes the artificiality of task and setting. For instance, the groups were randomly assigned and hence comprise individuals who usually do not work together. Future work should focus on proceeding in real organizational settings through field experiments, for example. Sutton and Hargadon (1996) have conducted a study at a product design firm where they find that contextual differences between the lab and the real world (e.g., the nature of problems addressed) may explain the contrast between real world and laboratory findings. For our study, real-world contextual factors may also be important to understand the effectiveness of the idea generation methods used.

The study is subject to several limitations. The empirical application is based on a relatively small sample. Additional collection of data is necessary to understand the benefits and pitfalls of structure and visualizations to facilitate effective knowledge exchange and creation to generate novel business model ideas.

Moreover, further research should include objective measures to be collected, for example, through expert ratings, to understand the differences in idea generation quality and contrast them with subjective perceptions. Girotra and colleagues (2010) rightly point out that it is further necessary to measure if the group is able to select the best idea. To assess what the best idea of a group is, many researchers have suggested independent judges should assess the quality of generated ideas (Amabile, 1982; Amabile et al., 1996; Connolly et al., 1990; Girotra et al., 2010; Kramer et al., 1997). Specifically, Amabile and colleagues (1982; 1996) suggest the consensual assessment technique to assess creative artifacts with the help of established experts in that field. The technique has been developed by Amabile (1982) to compare parallel creative works created in response to the same assignment (Baer et al., 2004).
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4.8. Conclusion

While current business model literature identifies potential benefits of business model innovation in existing firms, the systematic identification and testing of idea generation methods for the very beginning of the business model innovation process are under-researched in both the idea generation and the business model field. We address this research gap by developing a model of idea generation method effectiveness for the specific task of business model ideation. Drawing on business model and idea generation literature, the model comprises variables for the assessment of idea generation methods for this specific task. We have moved beyond pure description and offer an illustrative application of the model in an experimental setting by showing that the business model canvas and C-Sketch offer different affordances for facilitating group communication compared with brainstorming. However, the subjective measures do not show advantages of either the business model canvas or C-Sketch compared with brainstorming, which received higher ratings on both process and outcome. Our first application of the model thus shows that there are differences between the tested methods; however, further research is required.

In summary, this study builds on extensive literature and on studies from interdisciplinary and complementary fields and provides a first illustrative application of effectiveness assessment. This study represents but a small step in this direction, and we hope it will aid future research and practice.

4.9. References

Chapter 4


Assessing Prototypes and Team Performance in Design Thinking Innovation Projects

Christophe Vetterli, Friederike Hoffmann, Walter Brenner, Falk Uebernickel, Martin J. Eppler

Abstract

This exploratory study focuses on design thinking innovation teams working on three different innovation tasks: business model innovation, service innovation, and product innovation. The teams have elaborated many and selected one final prototype in the course of the project. All but one team have been working face-to-face. By measuring both subjective and objective performance, we compare the different innovation tasks and the difference between face-to-face and virtual teams and their impact on team performance. Our preliminary study shows that while the generation of many prototypes seems indeed to support the selection of the best final prototype, it is mostly the team process which impacts the quantity and quality of the final prototype. The virtually cooperating team working on a service innovation tasks experienced major difficulties in the process, while we can report that the business model innovation team generated the most prototypes while working in a comparably harmonious team.

Keywords: Design Thinking; Innovation; Prototypes; Innovation Teams; Performance Measures; Idea Selection; Business Model Innovation, Service Innovation, Product Innovation.

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5.1. Introduction

Design Thinking is an innovation approach that has received much attention from researchers and practitioners alike (Cross, 2001; Cross, Dorst, & Roozenburg, 1992; Markus et al., 2002). Design thinking with its iterative cycles of creation, testing, and reframing, remains always human centered and aims to develop many ideas in the form of prototypes, with one final idea to be selected at the end of a design thinking project. Design thinking can be situated within front-end innovation research (Koen et al., 2001; Reinertsen, 1999) is especially helpful to position the output of design thinking innovation teams. Design thinking is especially promising and much recommended to support innovation and innovation teams in organizations (Sutton & Hargadon, 1996).

We provide a preliminary study of design thinking teams and focus especially on analyzing teamwork process and outcome. Therefore, we measure both subjective and objective performance in design thinking teams. The design thinking teams in our study work on different innovation types, as a consequence of different innovation tasks, namely product, service and business model innovation. Performance assessment of innovation projects is a central issue in innovation management research (Blindenbach-Driessen et al., 2010), and especially the impact of teamwork on success (Hoegl & Gemuenden, 2001). However, design thinking as applied in practice, has not yet been sufficiently analyzed in this regard. Further, research has focused on virtual and face-to-face teams in innovation and R & D projects (Ebrahim et al., 2009; Schmidt et al., 2001), which is teams that are comprised of members who are located in more than one physical location (Powell et al., 2004).

Further, research on the performance assessment of innovation teams has progressed substantially, as well as on innovation tasks (Shah et al., 2000; Shah et al., 2003), for example product development (Hoegl & Parboteeah, 2006), service innovation (Blindenbach-Driessen et al., 2010), and business model innovation (Eppler et al., 2011).

Design thinking teams have been shown to perform well in front-end innovation activities (Dym et al., 2005; Stempfle & Badke-Schaub, 2002). However, so far the impact of design thinking on different innovation tasks has not yet been sufficiently analyzed. Specifically, we are interested in gaining a better understanding of which impact team metrics have in design thinking innovation teams, working on product, service and business model innovation tasks, on both outcome and process.
Our research question therefore can be defined as followed: *Do design thinking teams show different subjective and objective performance regarding outcome and process when working on different innovation tasks?*

This initial study focuses on design thinking in innovation teams and assesses the performance of three teams in specific, working on different innovation tasks, as well as teams working either face-to-face or in virtual teams. We measure both subjective and objective process and outcome variables of three distinct teams and compare the results. We proceed by conducting a review of the relevant literature on design thinking, front-end innovation and team collaboration. We introduce research on effectiveness measures for innovation teams and apply selected measures to three design thinking teams for a first test. We conclude the study by reporting and positioning our initial results for both researchers and practitioners.

### 5.2. Literature Review

Along with the classical stage gate innovation process, new approaches such as design thinking, have received much attention in recent innovation research and practice (Boland & Collopy, 2004; Grots & Pratschke, 2009; Sato, 2009) in order to enable idea generation and selection (Girotra et al., 2010) and to reduce the uncertainty in innovation teams face to a large degree (Sicotte & Langley, 2000) especially in front-end innovation (Koen, et al., 2001). In the following, we review the relevant literature on design thinking, front-end of innovation and team collaboration.

#### 5.2.1. Design Thinking

Design thinking is a human-centered innovation method, based on central elements such as deep customer understanding, structured idea generation and rapid prototyping (Vetterli et al., 2011). This working definition can be integrated in the understanding of Leifer (2011), who argues that design thinking is the method that brings along the innovation itself as output. As observed in this study, the output is not yet a finished innovation as defined by Becker and Whisler (1967, p. 463): “Innovation is a process that follows invention, being separated from invention in time. Invention is the creative act, while innovation is the first or early employment of an idea by one organization or a set of organizations with similar goals.” As applied in the context of this study design thinking is the method, which establishes an iterative design process
of the creation, evaluation and selection of physical artifacts, or prototypes. These final prototypes still need engineering processes to be launched on markets, and therefore do not consist of all key attributes of innovation (Baregheh et al., 2009).

Design thinking, as applied in our context, has its roots in mechanical engineering at Stanford University (Dym, et al., 2005), with a strong product innovation focus. The main elements of design thinking are: Needfinding, ideation, prototyping, testing and redesigning (Nussbaum et al., 2005). Design thinking innovation starts with an innovation task, or problem statement, such as “war for professionals”, and is preferably already human oriented. The authors understand human centered as a consequent orientation of the innovators on human needs, which often remain unarticulated (Terwiesch & Loch, 2004). Design thinking teams iterate between the elements of the process by the pursuing methodological and time milestones to ensure the team delivers of many prototypes during the project as well as the final prototype. Hence the milestones are defined along specific prototype requirements: Critical Function Prototype; Dark Horse Prototype, Functional Prototype and Final Prototype (Skogstad, 2009; Vetterli, et al., 2011). Whereas the first two milestones, Critical Functional Prototypes and Dark Horse Prototypes, are meant to foster divergent thinking in the team, the milestones Functional Prototypes and Final Prototypes support converging thinking. Both phases are linked by a transition phase, in which design thinking innovation teams change from a diverging working mode to a converging working mode. Along the path is a Design Space Exploration stream which ensures the capture of the whole design space during the project (see Figure 1). The milestones as well as the defined innovation task are integrated in a design space, which represents the broad understanding of the context where the task, respectively the challenge or the problem is identified (Vetterli et al., 2011).
The main outputs of design thinking are developed and tested prototypes. Prototypes are understood as tangible developed ideas, which gain more depth in the course of the process. While at the beginning in the diverging phase multiple prototypes are developed, the second phase, the converging phase, is led by a focusing working mode to finish one highly resolve prototype. Research defines prototypes broadly, as the approximations of the final product along one or several dimensions of interest (Ulrich & Eppinger, 1994). Furthermore prototype is the most commonly used learning mechanism in the case of customized design (Terwiesch and Loch, 2004). Additionally they make it possible for innovators to anticipate how the product will be received by their customers, without incurring the cost of an actual launch (Terwiesch and Loch, 2004).

5.2.2. Front End Innovation

Based on the understanding of Koen and colleagues (2001) of Front-end innovation (FEI), this research stream is a suitable placement for the design thinking process as defined in this study.

Front-end innovation is often considered as the first step in the innovation process of the innovation value chain, followed by conversion and diffusion (Hansen & Birkinshaw, 2007). While there is much disagreement where the innovation process
starts (Hauschildt, 2001), most scientists agree that generating a new idea and providing a proof-of-concept are part of the innovation process (Skogstad, 2009). Reinertsen (1999) defines this part of the process as the “fuzzy front end” of innovation, or front-end innovation (Koen et al., 2001). A term more popular with researchers outside the U.S., FEI generates mixed views of which activities fall exactly under its rubric. Koen and colleagues (2001) have identified five FEI activities, which they have labeled as opportunity identification, opportunity analysis, idea generation, idea selection, and concept and technology development. All five FEI activities show the importance of linking the Front End of Innovation to the next step of the innovation process, the New Product and Process Development Phase (Kim & Wilemon, 2002). Design thinking as investigated in this study can be situated at the front-end of a complete innovation process, generating a highly resolute prototype which is ready to be integrated in the development process for market-ready products, services or business models. The design thinking process analyzed in this study integrates all 5 key activities of Koen and colleagues (2001).

5.2.3. Group Collaboration

Developing novel product, service or business model ideas is not an individual task. It has been acknowledged that idea generation tasks are often generated in formal or informal group collaborations (Garfield et al., 2001; Macrirmmon & Wagner, 1994), which makes idea generation both a cognitive and social process (Dennis et al., 1999; Garfield, et al., 2001; Nagasundaram & Dennis, 1993).

Design thinking is never conducted alone, always in groups to generate many ideas, test and refine the ideas in the form of prototypes and finally, to select the best idea generated. In our study, all but one team have been collaborating face-to-face, being at the same geographic location at the same time for the whole project. The team with the name "Venus" collaborated in a virtual team for the duration of the design thinking project. Team members have been split up between Switzerland and California. With globalization, transnational teams have become a reality for many organizations as well (Earley & Mosakowski, 2000). These so called virtual teams are defined as geographically-distributed teams (Powell, et al., 2004). Virtual teams collaborate by using virtual various communication support systems, such as online video conferencing, online shared documents and e-mails for example (Andres, 2002). Research has focused on comparing virtual and face-to-face teams in innovation and R
5.3. Team Performance Measures

In order to gain a better understanding on how the design thinking innovation teams collaborate, we employ both subjective and objective measures, as established in recent research on innovation teams. In the following, we provide an overview on research on the respective team innovation measures.

5.3.1. Subjective Measures

The subjective performance measures in innovation teams used in this study are derived from multiple scales. Research has found that teamwork quality (TWQ) is positively related to team performance, as well as success of team members (Hoegl & Gemuenden, 2001). Hoegl and Parboteeah (2006) developed and tested a comprehensive TWQ concept, which allows for perceived measure of performance and member satisfaction. Specifically, the authors combine teamwork quality measures (communication, coordination, balance of contributions, mutual support, effort and cohesion) with team performance measures (effectiveness and efficiency) and personal success measures (work satisfaction and learning). While Hoegl and Gemuenden (2001) differentiate between the effects on managers, team leaders and team members, and found considerable differences regarding the performance ratings, we focus solely on team members, as no managers and team leaders were involved. Further, research has found that team reflexivity is positively related to effectiveness by supporting the teams in finding better solutions to the problems they are facing (Hoegl and Parboteeah, 2006: 115). We use the combined scale by Hoegl and Parboteeah (2006) to measure team reflexivity in innovation teams. By extending West's (1996) work on team reflexivity and effectiveness, the authors extend the concept by adding the dimensions of social skills and project management skills as determinants of reflexivity. Measuring team reflexivity may offer powerful insights into areas where innovation teams can be influenced in order to enhance their performance; therefore, it is important to include this measure in our study of examining design thinking innovation team performance.
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Anderson and West (1998) suggest the team climate inventory (TCI) which has been developed and tested by the authors in order to identify factors for innovativeness of teams based on team climate. In our study, we did not use the entire scale to assess the team climate, but selected two facet-specific climate scales of vision (all 12 items) and team participation (9 items) to understand these aspects in design thinking innovation teams.

Finally, we use the scale developed by Blindenbach-Driessen and colleagues (2010) to measure the overall performance of design thinking innovation teams. Performance is defined as a combination of operational, i.e. technical performance and captured knowledge, and product performance, i.e. customer satisfaction and competitive advantage of the developed innovation. Initially, the scale has been developed by the authors to measure the performance of new product and service innovation projects. We apply the scale to measure the performance of a design thinking business model innovation project as well.

Based on research on subjective innovation team performance, we expect that all design thinking teams to show comparable measures regarding team work quality, team reflexivity, team climate, and team performance.

5.3.2. Objective Idea Quality Measures

Objective idea quality measures are based on the literature of idea effectiveness and are based on both idea quantity and quality. The quantity of the idea generation method is identified by simply counting the total number of ideas generated per team. Research argues that by generating many ideas, teams are more likely to generate good ideas (Diehl & Stroebe, 1987; Simonton, 1999). However, researchers have for most parts moved away from counting the total number of ideas to focus mostly on the examination of the average idea quality as well as the quality of the best idea. Girotra and colleagues (2010) rightly point out that it is further necessary to measure if the group is able to select the best idea. Design thinking leads to the selection and further development of the best idea generated in the course of the project. The final prototype is often a combination of the best ideas a team has had. By constantly developing ideas, the design thinking team further tends to combine features from different ideas generated, which in the end often constitute the final prototype, which is the best idea of the design thinking team (Cross, 2000; Skogstad, 2009).
Idea generation research (Diehl & Stroebe, 1987; Simonton, 1999) often focuses on product innovation, where it is argued that by generating many ideas, also better ideas are generated. As product innovation is the most traditional of all three innovation types, we would expect that the product innovation team generates more ideas than the service innovation and the business model innovation team.

Many different operationalization of quality are used in research projects (Faure, 2004). Most common, idea quality is defined as a combination of originality and feasibility (Diehl and Stroebe, 1987). Rietzschel and colleagues (2010: 48) define a good quality idea as “both highly original (or unusual) and highly feasible (or useful).” Girotra and colleagues (2010: 593) have suggested broadening the measure based on extreme value theory, which proposes that a group can discern good ideas from bad ideas. The expected quality of the best ideas is driven by the number of ideas generated, the average idea quality, and the variance of the quality distribution (Girotra et al., 2010: 593). The quality measure used in this study reflects the multi-dimensions of the measure, consisting of seven different metrics in total: Technical feasibility, novelty, specificity, demand, overall value, creativity, and value for the target group. The first five metrics have been established and verified by Girotra and colleagues (2010); the final two metrics are derived from the assessment of Kramer (1997). The scale was measured on a ten-point Likert scale ranging from very poor to very good.

Based on the review of the relevant literature, we believe that the selected measures will provide valuable insights in design thinking teams working on different tasks and in different collaboration forms. Further, we expect that all design thinking teams which have been analyzed for this study will show equally good expert ratings of their prototypes and all be able to select the best idea, or prototype, they have generated.

5.4. Design Thinking Case

In this section we discuss the case study design, the preliminary data collection, and we characterize our sample. Innovation with the design thinking approach is of much interest for researchers and practitioners (Cross, 2001; Cross, et al., 1992; Markus, et al., 2002). The purpose of the study therefore involves a first application of the team innovation measures on design thinking teams working on different innovation tasks and in different collaboration settings (face-to-face and virtual).
5.4.1. Case Study Design

The design thinking team performance has been assessed using measures derived from research on innovation teams. The design thinking process and setting (Figure 2) is further described in this section. While research has acknowledged the importance of generating and selecting the best idea in innovation processes (Girotra et al., 2010), there is limited evidence on our research question in the existing literature. Thus, we have chosen an exploratory, data-rich research design to answer our research question (Eisenhardt & Graebner, 2007). Our study is concerned with innovation teams which solve product-oriented, service-oriented and business model oriented innovation tasks using the design thinking innovation methodology. The final outcome of a design thinking innovation project is one highly tangible prototype. This final prototype has been developed by building, refining, and dropping many prototypes before finally selecting one prototype. It is critical to maintain the real-life context of design thinking innovation in teams, since we do not know ex ante how the teams will perform. A multiple exploratory case study design fulfills these requirements (Eisenhardt & Graebner, 2007; Yin, 2003).

5.4.2. Three Design Thinking Teams

The context of this research was a graduate course at a Swiss University which focuses on applying design thinking on a real-life innovation challenge, offered by different industry partners. These industry partners are from different industries and offer the design teams an innovation challenge for a 10-month working period before receiving the final prototype as final deliverable of the project. The design teams consist of graduate students with multidisciplinary backgrounds, as well as prior working experience. Following the overall development of the design thinking appliance fields, the focus of appliance of design thinking within this study integrates all innovation types: product, service and business model innovation. The class of 2010/2011 consisted of seven teams with three students each.

The design thinking teams started in September 2010, with no or little theoretically-based knowledge about the design thinking method and graduated from the course in July 2011 with no breaks in between. The teams passed the different milestones, described in Figure 1, in order to finish their projects.
During this time, each team received weekly coaching based on methodological input, as well as team dynamic aspects which may call for more or less coaching, e.g. the moderation of discussions to facilitate team difficulties. The weekly coaching was provided through design thinking experts, all of whom have been experienced in team dynamics. Additionally to the weekly team-based coaching, the teams have exchanged their experiences with the other design thinking teams on a regular basis in large weekly group meetings. Both individual team coaching and large group meeting have helped the teams to develop their prototypes and to integrate the feedback gained in the testing of their prototypes. Each team has experienced difficulties regarding their team collaboration and design thinking activities. These difficulties have impacted, to differing degrees, as shown in the following analytics.

Figure 2: Case Study Design

In depth, we have analyzed three different teams with three different innovation challenges: Product innovation task, and service innovation task and business model innovation task. In order to keep the teams anonymous, we labeled them as shown in figure 2: Mercury (product innovation team), Venus (service innovation team) and Mars (business model innovation team). Team Venus collaborated as a virtual team, the other two teams worked in face-to-face collaboration.

The data collection has been conducted with team members and experts in order to assess the performance of design thinking teams working on different tasks and in either face-to-face or virtual collaboration. Subjective measures have been collected
with a questionnaire, filled out by each team member, and objective performance measures have been collected from expert ratings. The experts rated the quality of the best idea, or prototype. After every main milestone, every single team member received the developed questionnaire via e-mail and filled it out through an online-platform.

5.4.3. Measures

To compare team performance of the three selected design thinking teams working on different innovation tasks, as well as in either face-to-face (team Mercury and team Mars) or virtual collaboration (team Venus), we have used both subjective and objective measures, as developed in the previous section. First, the team members filled in the questionnaire individually after each milestone, and second, independent experts rated the generated prototypes. The individual measures for innovation teams are team reflexivity (Hoegl & Parboteeh, 2006), TWQ (Hoegl & Gemuenden, 2001), vision and participation safety (Anderson & West, 1998), and innovation team performance assessment (Blindenbach-Driessen et al., 2010).

Team reflexivity (Hoegl & Parboteeh, 2006) has been measured using a 5-point Likert scale (strongly disagree - strongly agree), which is composed of three individual constructs: reflexivity (5 items), social skills (6 items) and project management skills (2 items). For these measures we used validated scales, and collected the data through a questionnaire throughout the design thinking project.

TWQ (Hoegl and Gemuenden, 2001) has been measured using a 5 point-Likert scale (strongly disagree - strongly agree), which is composed of team work quality, team performance and personal success. TWQ is composed of communication (10 items), coordination (4 items), balance of members contribution (3 items), mutual support (6 items), effort (4 items), and cohesion (10 items). Team performance measures two constructs: team effectiveness (10 items), and team efficiency (5 items, shorted to 4 items). Personal success is constructed by work satisfaction (3 items) and learning (5 items).

We have used scales developed and tested by Anderson and West's (1998), which are part of the TCI to assess both vision and participation safety of the design thinking teams. We did not include other measures suggested by the authors, as support for innovation, task orientation and interaction frequency. Vision (11 items) and
participation safety (9 items) are measured using a 7-point Likert scale (not at all - completely).

Finally, we used the scale developed and tested by Blindenbach-Driessen and colleagues (2010) to complete the subjective measures with a performance assessment of individual design thinking team members. The scale consists of 12 items in total and has been shortened to 9 items, measured on an 8-point Likert scale (fully disagree - totally agree, not applicable).

The objective assessment of the developed prototypes has been conducted with an expert rating. The experts, 7 in total, filled out a questionnaire for each prototype developed. Here, we analyzed only the assessment of the final prototype of each design thinking team. The assessment has been conducted using a 7-point Likert scale (very poor - very good) on originality, feasibility, specificity, demand, creativity, value and overall value of the final prototype.

<table>
<thead>
<tr>
<th>Measure of Idea Quality</th>
<th>Source</th>
</tr>
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<tbody>
<tr>
<td>Overall Value</td>
<td>(Girotra et al., 2010)</td>
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<tr>
<td>(Technical) Feasibility</td>
<td>(Shah et al., 2000) (Girotra et al., 2010) (Rietzschel et al., 2010) (Gallupe et al., 1992) (Diehl &amp; Stroebe, 1987)</td>
</tr>
<tr>
<td>Novelty/Originality</td>
<td>(Rietzschel et al., 2010) (Gallupe et al., 1992)</td>
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<tr>
<td>Creativity</td>
<td>(Kramer et al., 1997)</td>
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<tr>
<td>Interesting/Valuable</td>
<td>(Girotra et al., 2010) (“Valuable for customers”) (Kramer et al., 1997) (“Interesting for customers”)</td>
</tr>
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Table 1: Objective Quality Measures

The questionnaires have been analyzed using descriptive statistics on team level and using within cross-team analysis. All prototypes have been rated subjectively from team members and the final prototypes had been rated subjectively from the teams and objectively from experts. Additionally, the team members reflected on progress and output on an individual base as well as for the whole team. The results were coded and reviewed independently by experts. For a comprehensive overview on both subjective and objective measures, in addition to the qualitative measures of the study, also quantitative measures were considered, i.e. the total amount of prototypes generated in the single projects and as well as an overall comparison. As the sample three design thinking teams has been very small, we did not conduct an extensive quantitative analysis. Instead, we proceeded by applying descriptive data analysis as first indicator to understand team performance in design thinking innovation teams working on
different innovation types as well as in different collaboration forms. Our findings are outlined in the following section.

5.5. Findings

Girotra and colleagues (2010) highlighted the importance of not only generating good ideas, but enabling teams to select the best idea. Design thinking leads teams to develop as many prototypes as possible in the diverging phase, followed by consolidating their ideas and combine most successful elements of prototypes in the converging phase. At the end one single best prototype is created.

Regarding the objective measures, we can report the following results: The seven design thinking teams generated a total quantity of between 21 and 43 prototypes, with an average of 34 prototypes per team. Most prototypes have been generated in the first phase (diverging phase), which involved the development of critical function prototypes and dark horse prototypes, as indented in the design thinking cycle (Figure 3).

![Overview of all Seven Innovation Teams](image)

**Figure 3: Overview Seven Design Thinking Innovation Teams**

As planned in the second, converging design thinking phase, the amount of prototypes over all teams converged during the functional prototypes and the final prototype at the end (Figure 1).
Figure 4: Amount of the generated prototypes of the three selected teams

The teams that had both the best objective and subjective performance and process measures, developed also an above average number of prototypes (team Mercury and team Mars). The service innovation design thinking team (team Venus) created the least amount of prototypes with 21 prototypes in total. Surprisingly, the complexity of the business model innovation task did not prevent team Mars from developing the most prototypes of the three selected teams with 43 prototypes in total, followed by the product innovation team with 39 prototypes.

Based on idea generation research (Diehl & Stroebe, 1987; Simonton, 1999), we have expected that the product innovation team would generate the most ideas, followed by the service innovation team and then the business model innovation team.

Hence, in our study on design thinking innovation teams, we have found evidence that the amount of developed prototypes, which is often considered the critical factor for the selection of the best idea (Diehl & Stroebe, 1987; Simonton, 1999), seems to be indeed an indicator for the quality of the best idea. However, as the service innovation team developed the least amount of prototypes, but still a great idea in the end, this finding has to be examined carefully and needs to be verified by future research.
Furthermore, based on the objective expert rating to measure the quality, we show that all design thinking teams managed to select the best idea they developed in the course of the 10 month. However, not all prototypes have been rated equally with regard to their readiness for implementation. Prototypes which are rated especially high regarding their complexity (Klein & Sorra, 1996; Simpson, 2009; Tornatzky & Klein, 1982), appear to be rather difficult to be implemented in a timely manner, which mirror the expert rating in the case of team Venus, a product innovation team.

Regarding the subjective measures, we can report the following results: The teamwork quality scale (TMQ) is positive related to team performance in the innovation literature (Hoegl & Gemuenden, 2001). While the business model innovation team and the product innovation team ranked their team work quality as expected with a motivated and positive beginning, a considerate low in the dark horse phase and afterwards a positive continuation of the team work until at the end of the project, the quality has been again rated about as positive as at the beginning. However, for the service innovation team, which was the only team working in a virtual team; the ups and downs have been especially strong compared to the other teams. Comparing the team work quality ratings and the objective performance ratings, we find that the teams collaborating constantly well over time have better final quality ratings as compared to the team which experienced major difficulties. However, as the majority of the seven teams experienced comparable difficulties, as intended, in the dark horse phase and only one of the design thinking teams, working in a virtual team experienced continuing difficulties, we suggest that this finding may be based on the virtual collaboration. A central aspect, as mentioned by the team members of the virtually collaborating service innovation team, that was the missing participation and engagement of the other virtually collaborating part of the team. Kohler and colleagues (2011) showed that these are two of the key aspects of co-creation systems which should support the virtual innovation process that are often missing. Finally, the two parts of the service innovation team pursuit two separate innovation tracks and only at the end of the design thinking process engaged in combining the individually created results.

Team reflexivity has also been found to be positively related to team effectiveness (Hoegl and Parboteeah, 2006).
We have found that team reflexivity was lowest for the service innovation team working in a virtual team, with major ups and downs. Interesting as well is that the reflexivity level of the beginning of the design thinking innovation project is reached again in the functional prototype phase, but not with the final prototype, as in all other teams. Especially the business model innovation team had problems starting off, which may be related to the complexity and level of abstraction of the task. Team Mercury has been starting at a higher level of reflexivity, but could not continue on this level of over the course of the whole project. Overall, team reflexivity has not been growing over time, but rather declining for most items in all teams. The team climate inventory (TCI) subscales of vision and team participation by Anderson and West (1998) provided again surprising results for the design thinking teams:
Figure 6: Team Climate Inventory Analysis Example of three teams

The business model innovation team has started rather pessimistic. However, we can report constant rising of the team climate scales of vision and team participation until the functional prototype phase. Compared to the other teams in this study, this team had the strongest improvement in team climate, but nevertheless ended up at the lowest level for the two scales compared to the other two teams. As for the product innovation team Mercury, the level of team climate remained at the same level at the beginning and at the end or some tendencies to lose team climate over the whole period. The service innovation team surprised again, as the team started off with a rather positive climate over both parts of the virtual collaborating teams and then lost strong ground during the darkhorse prototyping phase, but recovered during the next phase. At the end the team climate suffered, as the team finished with a lower team climate compared to the starting point. Future research may investigate this point further.

The overall innovation team performance of Blindenbach-Driessen and colleagues (2010) continued to support the findings of the above described scales:
The business model (Mars) and product innovation team (Mercury) have reported some small insecurities regarding the quality of their performance and the likelihood of success in the dark horse prototype phase and functional phase, but stayed relatively stable compared to the service innovation team (Venus). While the service innovation team (Venus) started optimistic and felt in a deep insecurity phase during the dark horse prototype time, it recovered in the following phase to end at the same level of subjective performance ratings for both parts of the virtually collaborating team compared to team Mercury.

Overall, the following findings could be verified: The objective measures, which have been provided by industry experts, have confirmed that all design thinking teams have managed to select the best idea they have developed.

The subjective measures provide a more differentiated picture. Our comparison of the three design thinking indicates that the teams have been satisfied with selection of the final prototype as well as with the quality of ideas developed. We have also found that team Venus, working in virtual collaboration mode, has experienced major difficulties for the majority of the project. Additionally, this team had produced the smallest total amount of prototypes in the project. The diverging phase has been especially dominated by low satisfaction with process, team communication, and team work.
quality compared to the other teams. Team Mercury with the product innovation task has had the most stability and generated both objectively and subjectively qualitative high outputs. Team Mars with the business model innovation challenge has been relatively stable in their subjective performance rating compared to team Venus, the service prototyping team, when comparing overall scales.

5.6. Contribution

The conducted study provides a preliminary overview on design thinking teams working on different innovation tasks and the effects on both outcome and process. We have analyzed how design thinking teams work when they are not, as previously often the case, composed of mostly mechanical engineers, but in this case students of business administration, whereas working on and with prototypes is unusual in the idea generation phase. Design thinking is a human-oriented innovation method, which has originally been used for innovation in mechanical engineering and is now applied to a much wider field, especially business administration environment. So far, there has been no test of the effects of design thinking in this environment. We applied team innovation process and outcome scales to be able to compare the design thinking teams, which all followed the process, however, with strongly differing innovation tasks. Based on our preliminary study, we argue that design thinking is generally suitable for all innovation types, as the final prototypes have all received high quality ratings.

Specifically, we have found that the subjectively measured output ratings support very much the objectively measured output ratings, with the only exception being the service innovation team. Girotra and colleagues (2010) have argued that the most important step in idea generation is the selection of the best generated idea, not just the generation of many ideas. Contrary to our initial expectation, it was not that product innovation teams generated the most ideas. Instead, the business model innovation team with the most complex and abstract innovation task, developed more prototypes than the product innovation task team. As our sample is small, we may not generalize from our findings and recommend instead further research endeavors do enlarge the sample.

5.6.1. Theoretical Implications
For design thinking it appears, as our preliminary study shows, that the innovation task, or type, does not impact the total number of ideas generated. However, for the service innovation team, which worked in a virtual team, we have found that this team experienced major difficulties, which impacted the subjective ratings to a great extent. Although the team was not satisfied with the performance, the industry partners of the team expressed great satisfaction in the objective quality ratings. Virtual teams are of much research interest (Linda & Charles, 2007), which most focus on how collaboration and communication can be facilitated. In practice, virtual teams are a reality in the globalized economy for many firms. In our research, we observed that the virtual collaborating team experienced significant difficulties in the innovation process. However, the impact on the results, i.e. the final prototype, have been marginal, if there were any at all. Thus, we would recommend that future research could focus on comparing virtual and traditional design thinking teams working on a comparable task, for example, working all on service innovation tasks.

Future research may also focus on the impact of coaching in the process, especially in the dark horse prototyping phase, the phase which caused the difficulties for almost all teams, which became visible across all measures. Based on our observations, we identified another interesting research focus. the shift from diverging to converging thinking in design thinking teams. The conversion of the insights and learning's takes place in the converging phases towards the creation of the final prototype. However, the insecurity is greatest in the beginning, when creativity needs to spark and little guidance is provided. Understanding how and when the transition is made in design thinking teams will aid future facilitation efforts greatly.

5.6.2. Practical Implications

The findings of this study are especially relevant for practitioners thinking about implementing new or changing and adapting current innovation processes. First of all, we provide first evidence that design thinking can be applied for more complex and abstract innovation types such as service and business model innovation, although it has mostly been used for product innovation previously. Design thinking has received much attention and we could show in our preliminary study that generating many prototypes by following the design thinking milestones, which facilitate the generation many as well as of rather distinct prototypes, leads to the generation and selection of the best prototype and therewith idea. This is an
important finding according to Girotra and colleagues (2010), as the selection of the best idea is crucial. Even teams experiencing major difficulties in the process, as the virtual service innovation team in our study developed a good quality final prototype which has been valued by the industry partner.

The creation of many prototypes supports the selection of the best ideas, however, even when the total number of prototypes falls below the average of number of prototypes for the service innovation team, the final prototype has been rated just as good. Design thinking fosters the creation of many and distinct prototypes in the different prototype phases, which provides an opportunity for teams to improve the overall performance through continuous testing and learning and therewith enhances the chances of selecting the best idea in the end. Finally, as an anecdotal note, the involvement and at the same time distance to the industry partners who sponsored the design thinking project facilitated the innovation process, as the input helped to guide the team on one side, and on the other facilitated the transition of the idea and implementation in the firm, as the industry partner gained continuously ownership of the idea. Nevertheless, more research is needed on how innovation diffusion can be stronger enabled within design thinking.

5.7. Limitations and Future Research

This study is subject to a number of limitations. First of all, the sample size is too small to run anything but descriptive statistics. The study assesses only three design thinking teams in depth, each working on a different innovation type. Future research may extend the study on design thinking teams working on different innovation tasks as well as in different collaboration modes. Current research on innovation teams and team composition may provide further research opportunities and shift the focus from our initial performance comparison. Additional qualitative research material, such as interviews with both team members (alone and in the team) and industry partners may provide important insights on design thinking team performance.

Future research may also elaborate on design thinking prototypes and how they change in the course of the project from very simple prototypes, such as sketches to more and more functional prototypes. This has not been within the focus of this study, but may provide interesting and challenging opportunities for further research.
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The impact of cultural diversity on design thinking innovation teams may be one area of interest. One design thinking team has been working not only in a virtual team, but also in a cultural diverse team with both Swiss and U.S. American team members. Staples and Zhao (2006) have focused in their study on the impact of cultural diversity on both virtual and face-to-face teams; their study may provide a helpful starting point for further research.

5.8. Conclusion

Following up on our initial research question: Do design thinking teams show different subjective and objective performance regarding outcome and process when working on different innovation tasks?, we provide a preliminary answer by applying established innovation team scales to measure the impact of performances in design thinking innovation teams. The innovation tasks were divided in product, business model and service innovation. The teams mastered the design thinking process with differences regarding their reflexivity, vision, participation safety and subjective performance assessment. Nevertheless, the final prototype can be reported to be of equal high quality, as rated by independent experts. Therewith, we have moved beyond pure description and offer an illustrative application in a case study design. Specifically, in terms of team climate inventory, team reflexivity and overall team performances the virtually collaborating team (Team Venus) with the service innovation task experienced strong up and downs, documented in all scales and generated the least amount of prototypes. Surprisingly, the business model innovation team (Team Mars) developed the largest amount of prototypes, although the complexity and abstraction of the innovation task was especially high. Finally, the product innovation team (Team Mercury) did not outperform the other teams, but delivered an overall solid performance over the course of the design thinking project. In sum, this study provides first understanding of the role of the performance of design thinking teams working on different tasks and in different collaboration modes. This study represents a small step in this direction and we hope it will aid future research and practice.
5.9. References


Chapter 5

Team Functioning. *Academy of Management Journal, 43*(1), 26–49.


Chapter 5


Chapter 5


Chapter 6

Synthesis

‘Every organization has to prepare for the abandonment of everything it does.’
Peter Drucker

This chapter combines the findings, limitations, and opportunities for further research of the individual articles in this thesis to provide an overarching synthesis, based on a critical examination of what has been achieved, of the implications that can be derived from the four articles as well as potential research avenues which may be followed in the future. Due to the very nature of a cumulative dissertation, not all the insights of the individual articles can be fully integrated. Yet, the most important insights for each field are presented, without focusing in depth on the contributions outlined in the individual articles, which can be accessed in Chapters 2 – 5.

The chapter begins with a summary of the main findings, followed by the implications for research and practice, as well as the methodological implications. In concluding this chapter, the limitations of this dissertation project are examined and avenues for future research are explored.

6.1. Summary and Main Findings

This thesis explores how the very beginning of business model innovation, i.e. the generation of novel business model ideas, can be supported by different visual idea generation methods in teams. In particular, four research questions are answered in four articles.

As a first step, a literature review combined two literature streams: the literature on business model innovation and the literature on idea generation. The literature review outlined not only the relevance of this research, since the development of novel and sustainable business model ideas is among the core challenges for management teams (Chesbrough, 2006; Christensen & Overdorff, 2000), but provided guidance for the empirical research in Chapters 3 – 5. The literature review suggested that teams developing novel business model ideas face a number of challenges, which lead to requirements for business model ideation methods. The literature review also synthesized three core requirements for methods suitable to developing novel business model ideas: knowledge and understanding of the problem, creativity, and
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Visualization. When applied to a list of all identified ideation methods in both literature streams, six methods fulfilled all three requirements: Business Model Canvas, Blue Ocean, Batelle-Bildmappen-Brainwriting, Collaborative Sketching, Design Thinking, and Visual Synectics. In this way, an important gap could be closed: a mechanism was developed to select business model ideation methods. Moreover, a comprehensive overview is presented of which methods have been developed in the two literature streams relevant for the topic and a first selection of methods is provided (Chapter 2). A systematic overview of research on business model innovation is provided; this shows which requirements are essential for developing novel business model ideas in firms and which methods are suitable for the task of business model ideation.

In Chapter 3, this thesis proceeded by providing an initial test of two of the identified visual idea generation methods, specifically, the Business Model Canvas and Collaborative Sketching in an experiment with an unsupported control condition. Not all six methods could be tested in this thesis, as sufficient statistical power could not have been attained for each condition. The selection of the two visual ideation methods is based on the aim to choose two widely different methods in accordance with the fluid-frozen visual boundary objects dimension (Whyte et al., 2007).

Hence, the categorization of frozen and fluid boundary objects provided an important base for the experiment. The Business Model Canvas is a frozen visualization, while collaboratively created sketches represent fluid visualizations. By testing a method for each category, this research has advanced the understanding of boundary objects in the context of business model innovation. Specifically, the research results suggest that visualizations have a positive impact on team processes in developing new business model ideas, and that frozen visualizations, such as templates, support collaboration by providing structure, while fluid forms foster creativity through ambiguity. Doganova and Eyquem-Renault (2009, p. 1568) argued that the visualization of a business model acts as boundary object and is especially helpful in both communicating and adapting a business model idea because of the ambiguity inherent in visualizations: “it is robust enough to make the initially overflowing situation calculable and capture the interest of potential partners, but at the same time it is flexible enough to allow for the changes required by the enrolment of these partners.” Thus, both fluid and frozen forms of visualizations may be important to gain further insights.
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For the experiment in Chapter 3, testable hypotheses were developed (H1 – H3), positing that the artifacts used by a team for facilitating business model innovation affect collaboration, creativity, and the adoption of the proposed business model, that is, they make it possible not only to develop one best idea, but also to select the best idea. The scales were confirmed with a reliability analysis, followed by a univariate analysis of variance (ANOVA) of the data (N=45). Hypothesis 1 could be supported, indicating that objects have a positive impact on collaboration, compared to Brainstorming, the control condition. However, the frozen visualization of the canvas did not foster perceived creativity, while the fluid visualization of sketches in combination with objects did positively impact on the perceived creativity of the subjects. Finally, the experiment suggests that the canvas also increases caution regarding the implementation of the developed ideas when compared to sketching with objects. These findings provide support for the argument made by Lurie and Manson (2007), who built on the research of Griffin and Tversky (1992) and argued that underconfidence may be caused by “visualizations that provide greater context” (Lurie and Manson, 2007, p. 165).

Surprisingly, there was little difference between the ‘sketching with objects’ condition and Brainstorming. While Brainstorming is one of the most commonly used ideation methods, it is nevertheless flawed (Connolly et al., 1993), for example through inducing production blocking or negative feedback (Nijstad & Stroebe, 2006). Hence, any of the selected ideation methods should have provided superior team experience. Two potential explanations for the small difference found are that subjects were familiar with Brainstorming and, therefore, felt more secure in the process (Baruah & Paulus, 2008; Gist, 1989). Furthermore, using sketching and objects is rather unconventional for management teams, so using this method may have resulted in too much insecurity of the teams, and may have therefore distracted the attention.

Overall, while the results indicate that artifacts provide stimuli for improving collaboration quality in business model ideation teams, this research also underlines that it is important to consider the differences between frozen and fluid forms of visualizations (Whyte et al., 2007) in teams working on wicked and ill-defined tasks.

Chapter 4 built on the experiment conducted in Chapter 3 and reported results from an enlarged experiment with a total of 112 subjects using either the Business Model Canvas, Collaborative Sketching, or the control condition, Brainstorming. Four hypotheses were developed (H1-H4) positing that satisfaction with process,
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satisfaction with results, and communication are positively affected when visual idea generation methods are used as opposed to the control condition. This research posits further that Collaborative Sketching would have a positive impact on group work preference.

A univariate analysis of variance (ANOVA) was conducted to analyze the data. The homogeneity of the variance test provided satisfactory results for all variables. Subjects who worked with either visual idea generation method reported significantly lower values for satisfaction with the process, for working in groups, and for communication quality. However, all teams working with visual ideation methods reported about equal satisfaction with the generated results. The results are surprising as they contradict the hypotheses and show that existing theories cannot explain the phenomenon sufficiently. However, a closer look at the data provides some plausible explanations for these surprising findings.

The results indicate that not only the structure provided by visualizations, as in the Business Model Canvas, but potentially also the activity of sketching, rarely practiced by many managers, make the idea generation process less enjoyable for teams that use either method for the first time.

Participants reported that while the Business Model Canvas was helpful in showing relationships between the components of a business model, at the same time, it was difficult to fit all the information into the boxes and keep track of the large amounts of information. The problem of the missing overview of the most important information has been found in research on tree and network visualizations (Johnson & Schneiderman, 1991; Lurie & Manson, 2007). Hence, the empirical results suggest that experience with a particular visual idea generation method may be an important predictor of satisfaction with process, satisfaction with results, and communication. This conjecture is supported by Bederson and Shneiderman (2003) who suggested that it is the level of expertise with a visual tool or method which will moderate its advantages.

The only idea generation process that was satisfying was the Brainstorming idea generation, a method widely known and applied, thus leading to little or no insecurities regarding the execution of the process. However, although team members may not have enjoyed the process and the communication while generating ideas, they were
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equally satisfied with the results, which may indicate that process variables may not be the most important indicators for the success of business model ideation. This argument is in line with the research of Girotra and colleagues (2010) on the importance for teams of being able to develop and select the best idea. Nonetheless, satisfaction with process and outcome is a key antecedent to the repeated use of a particular method (Reinig, 2003). Teams may thus face paradoxical situations in which unfamiliar methods like the Business Model Canvas or Collaborative Sketching are not adopted for repeat usage although they produce valuable business model ideas.

Chapter 5 answered the question of how one of the identified visual ideation methods, Design Thinking, compared when applied to different tasks. To date, Design Thinking has been used to develop novel product and service ideas (Dym et al., 2005; Ward et al., 2009), but not business model ideas. Design Thinking proved to be a suitable visual method to develop novel business model ideas. Furthermore, Chapter 5 provided insights into how the visualization of ideas, in the form of prototypes, aids idea generation for products, services, and especially ill-defined innovation tasks, such as the development of novel business model ideas. Case studies were chosen as the research method to complement the experimental method, which is high in internal validity but low in external validity, and to meet the complexity of the Design Thinking approach, which cannot be investigated in controlled experiments since it involves repeated cycles feedback and reframing of the problem statement over the period of weeks and months. The case studies encapsulated rich context – which was necessary to understand the effects of visualizations on the ideation process – and not just individual team meeting sessions as in the experimental studies (Chapters 3 – 4). While experiments focus on specific aspects and can lead to generalizable findings, case studies provide the context of and application to real-world settings (Yin, 2003). Thus, the two methods complement each other to provide generalizable results and rich context information on how visual ideation methods support the task of business model ideation.

Specifically, case study research enables researchers to see links between the individual, the teams, and their environment (Yin, 2003), during the generation of novel business model ideas, while the experiments provided control over environmental influences. For example, to see team conflicts emerge over time, be resolved, and ultimately, lead to combined ideas an important factor that made the case studies essential. In this research, the case studies further made possible the assessment
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of team performance in Design Thinking projects and the analysis of differences regarding product, service, and business model innovation tasks. Hence, the case study approach enabled this research to collect both perceived data in the form of a questionnaire and objective data through the assessment of independent industry experts, who evaluated the results of the idea generation. At the same time, the idea generation process could be witnessed by participating observers. The process variables considered were teamwork quality (Hoegl & Gemuenden, 2001), team reflexivity (Hoegl & Parboteeah, 2006), and innovation team performance (Blindenbach-Driessen et al., 2010).

The objective quality measure used in the case study research reflects the multidimensionality of the measure and combines seven individual metrics: technical feasibility, novelty, specificity, demand, overall value, creativity, and value for the target group. The first five metrics were established and validated by Girotra and colleagues (2010); the final two metrics are derived from the assessment of Kramer (1997). The quality of the final prototype has been rated by independent industry experts.

This research indicates that the complexity of the tasks leads to more perceived conflicts within the innovation teams. However, the difficulties experienced in the process did not affect the quality of the generated ideas, as all teams developed highly-rated final ideas. While the service and the business model innovation teams experienced rather difficult team processes, with the virtual Design Thinking team experiencing the most challenging team process, their results were rated equally good.

In summary, this research indicates that Design Thinking is a suitable approach for the development of novel business models. The development of many prototypes facilitates not only communication, but also the quality of the best idea, which was refined and presented as the final prototype towards the end of the Design Thinking idea generation.

The main implications for research and practice are depicted in Table 1.

<table>
<thead>
<tr>
<th>Overall research goal:</th>
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<tr>
<td>Advance the understanding of how the application of different visual idea generation methods can support the generation of novel business model ideas in teams.</td>
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## Research questions

<table>
<thead>
<tr>
<th>Which methods are suitable for generating business model ideas?</th>
<th>How do artifacts affect the dynamics of teams working on the development of sustainable new business model ideas?</th>
<th>How do idea generation methods differ with regard to their support for knowledge communication?</th>
<th>Do Design Thinking teams show different subjective and objective performance regarding outcome and process when working on different innovation tasks?</th>
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### Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5

## Main Results and Theoretical Implications

<table>
<thead>
<tr>
<th>(1) Identification of requirements for business model ideation.</th>
<th>(1) Visual boundary objects positively affect the development of novel business model ideas.</th>
<th>(1) Teams report equal satisfaction with results, but lower satisfaction with process and communication in visual ideation teams.</th>
<th>(1) Design Thinking is a suitable visual ideation method to develop novel business model ideas.</th>
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<tbody>
<tr>
<td>(2) Framework development for the selection of business model ideation methods.</td>
<td>(2) Trade-off between fluid and frozen visualizations: creativity vs. structure.</td>
<td>(2) Teams are more satisfied with methods they are familiar with.</td>
<td>(2) Teamwork quality suffers in virtual Design Thinking teams the most (independent from the task), but does not impact on the results.</td>
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</table>

## Practical implications

<table>
<thead>
<tr>
<th>(1) Use the framework as conceptual tool for the identification of business model ideation methods.</th>
<th>(1) Use visual idea generation methods that rely on artifacts to develop novel business model ideas in teams.</th>
<th>(1) Consider that idea generation team members are most satisfied with methods they already know, as for example Brainstorming.</th>
<th>(1) Use Design Thinking for elaborate business model ideation in teams.</th>
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<tr>
<td>(2) Employ the six visual idea generation methods suggested for business model ideation in teams.</td>
<td>(2) Combine methods: a template for the definition of the status-quo and C-Sketching as creative stimulus for the development and combination of ideas.</td>
<td>(2) Use visual business model ideation methods, as they lead to comparable satisfaction with the generated results.</td>
<td>(2) Allow face-to-face teamwork for complex tasks, such as business model ideation, to ease the idea generation process for the team.</td>
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<table>
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<tr>
<th>Conclusion</th>
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<tr>
<td>Visual idea generation methods can facilitate the development of novel business model ideas in teams.</td>
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</table>

**Table 1: Implications for Research and Practice**

The next sections (6.2–6.4) elaborate further on the contributions of this research and outline the theoretical, methodological, and practical implications of the findings.

### 6.2. Contributions to Theory

This research aims to further our understanding of how different visual idea generation methods can support the generation of novel business model ideas in teams. Hence, this research contributes to the literature on business model innovation, idea generation, and visualization by making four overarching contributions that are derived from the individual contributions developed in the research articles.

First, while methods to develop business model ideas have been introduced by researchers (Frankenberger et al., 2012; Pateli & Giaglis, 2005), research has focused neither on understanding the requirements of developing business model ideas in firms nor on the systematic testing of methods for business model innovation beyond individual case studies. Research on idea generation is the classic field for the development and testing of idea generation methods. This research field also provides a classification of methods based on problem scope into broad, medium, and narrow problem statements (VanGundy, 1981), but has not focused on requirements for wicked and ill-defined tasks such as business model innovation. Therefore, this research makes a contribution to the idea generation literature by systematically examining the suitability of idea generation methods for a specific, hitherto neglected type of problem statement, i.e., business model innovation.

Moreover, as many real-life problems are increasingly difficult to formulate (Sieg et al., 2010), and the necessity to develop novel ideas continues, it is important to develop selection mechanisms to address these challenges (McAdam, 2004). Hence, this thesis contributes to the business model innovation literature and idea generation research by systematically developing a set of selection criteria for the identification of suitable business model ideation methods (Chapter 2). The three criteria are knowledge and understanding of the problem, creativity, and visualization. The
application of these criteria to a wide pool of idea generation methods yielded six methods which can, on theoretical grounds, be expected to support business model ideation. Thus, this research facilitates a systematic approach to selecting business model ideation methods.

To understand how the selected visual idea generation methods perform before applying them in firms, it was also important to study the benefits and limits of different visualizations inherent to the idea generation methods. Specifically, this research provides evidence that while Collaborative Sketching (Shah et al., 2001) offers more conceptual freedom and room for interpretation based on the ambiguity of sketches (Van der Lugt, 2005), thus representing “fluid” forms of boundary objects (Whyte et al., 2007), the Business Model Canvas (Osterwalder & Pigneur, 2010) is a “fixed” visual business model representation that fosters creativity by enforcing structure and restrictions.

Second, this research provides confirmation of the positive effects of visualizations, as part of visual ideation methods, on collaboration in the new context of business model innovation teams. The findings indicate that the stimuli and structure provided by visualizations (Stigliani, 2008) enhance collaboration in idea generation and thus foster creativity, for instance, in Collaborative Sketching.

Labeled as “concrete stimuli” (Smith, 2003), objects and pictures are known to improve idea generation; however, to date, little is known about the differences between stimuli provided by different ideation methods. Stigliani (2008) analyzed the impact of static visual artifacts in a product design firm, such as visual boards, on creativity and found that they fostered analogical and divergent thinking. While structure still appears to be preferred in management teams, it may also limit the teams’ creativity, while more creative stimuli, such as combining sketching and objects used in design teams, foster creativity while simultaneously increasing the teams’ insecurity regarding the task fulfillment. Stigliani (2008, p. 6) emphasizes the role of such boundary objects “in facilitating alignment, knowledge transfer, and decision making at different level of interaction: among members of the team, among the different practices […] and between the company and the external stakeholders.”

Furthermore, visualizations, such as templates, frameworks, and metaphors, have been found to lead to significantly higher participation in teams, also referred to as internal
sharing (Stigliani, 2008, p. 5), while no perceived differences regarding the satisfaction with the knowledge sharing process could be identified (Bresciani & Eppler, 2009). The research reported in this thesis identified different results regarding the satisfaction with both outcome and process when using different visual idea generation methods. In the experiment reported in Chapter 3, collaboration was significantly higher in teams using the canvas as opposed to teams using sketching and objects or Brainstorming. The studies in both Chapters 4 and 5 reported low satisfaction with the process, although the teams using the visual idea generation methods in Chapter 4 were rather satisfied with the results, and the teams in Chapter 5 generated and selected a high quality idea, as rated by independent experts. This confirms the hypothesis by Bresciani and Eppler (2009, p. 1078) that “visualization leads to objectively better results, but subjects do not perceive this difference.” In sum, then, the research in this dissertation provides further empirical evidence for the positive effect of visualization on collaboration in innovation teams, but also details this effect by highlighting that the teams themselves may not perceive this positive impact. This contribution is in line with existing research indicating that training or experience with visual tools has a positive impact on the idea generation process in teams (Baruah & Paulus, 2008; Bederson & Shneiderman, 2003; Gist, 1989). For example, Bederson and Shneiderman (2003) argued that it is the level of experience with a visual tool or method that might moderate its advantages. Hence, lack of experience may ultimately explain why the positive effects of visual ideation methods are not always perceived by the teams employing these methods.

Third, to develop novel business models, communication as well as knowledge exchange and creation among team members are essential, as argued in Chapter 2. However, research has also shown that interdisciplinary collaboration challenges mutual understanding and the combination of knowledge (Fay et al., 2006). To support the “surfacing and sharing [of] assumptions, [and] understanding [of] contexts” (Doz & Kosenen, 2010, p. 376), the role of visualization requires more attention. Doganova and Eyquem-Renault (2009) suggested that visual representations of a business model facilitate its communication to internal and external stakeholders as well as the continuous development of a business model. Hence, research has highlighted the role of visualizations for knowledge creation (Bresciani et al., 2008; Carlile, 2002; Eppler & Burkhard, 2007; Mengis & Eppler, 2006), and has shown that knowledge exchange in teams is supported by visualizations (Bresciani & Eppler, 2009; Comi & Eppler, 2011), with specific emphasis on the role of objects (Whyte et al., 2008; Whyte et al.,
2007). This research contributes to the research on knowledge visualization cited above by providing further empirical evidence that visualizations can both foster and limit knowledge exchange and creation in idea generation teams.

Specifically, while the research reported in Chapter 4 did not find evidence of a significant positive impact of visual ideation methods on communication, the teams were nonetheless equally satisfied with the results as the control group. This result suggests that knowledge exchange and communication did indeed take place. Moreover, as observed in the experiments and case studies, developing novel business ideas is often not a conflict-free process. Indeed, one may go as far as arguing more conflict led to better results in the Design Thinking teams. Hence, while participants may not overly enjoy the knowledge communication in the process (as indicated by the satisfaction measures), they nevertheless accomplish knowledge communication through the support of visual tools.

Different visual ideation methods support knowledge communication through different avenues. This research indicates that while the Business Model Canvas provides a clear structure through the nine boxes, which helps to ignite sharing knowledge, this very structure makes it especially difficult to then “get out of the box” again and develop new ideas. Also, visualizing too much information simultaneously can lead to difficulties for individuals in prioritizing the most relevant information as well as in discovering relationships between the business model components (Griffin & Tversky, 1992; Lurie & Manson, 2007). Hence, the “vividness” (Lurie & Manson, 2007; Nisbett & Ross, 1980) of a visualization used to develop novel business model ideas – which denotes the availability of specific information – helps to structure the process and lead to new insights, while at the same time running the risk of overloading the team with information, especially when the information is not captured graphically, as in the Business Model Canvas.

On the other hand, the ambiguity of sketches (Pfister & Eppler, 2012) challenges traditionally trained managers, as they are not used to sketching, but also leads to extended discussions when interpreting the developed sketches and facilitates building on other team members’ ideas. The prototypes developed in the Design Thinking teams facilitated the collection of feedback; in turn, this fostered the rapid development of new ideas, the improvement of ideas, and, eventually, the combination of features from different ideas to one final idea (Chapter 5). The graphic
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representation of information is another advantage when compared to the Business Model Canvas as “[t]he vividness of graphic information leads to greater attention” (Lurie & Manson, 2007, p. 166). Furthermore, as Collaborative Sketching builds on sketches only, the risk of overlooking non-graphic information (Glazer et al., 1992) is avoided.

Fourth, this research provides empirical evidence for two trade-offs. First, there is a trade-off between fluid forms of visualizations, such as sketching, and frozen visualizations, which are more structured and restricting, such as the Business Model Canvas, when applied to the development of novel business model ideas in teams (Whyte, et al., 2007). Thus, this research further advances research on the role of visual boundary objects in facilitating multidisciplinary teamwork (Carlile, 2002; Henderson, 1991; Nicolini et al., 2011; Yakura, 2002). Second, while both the Business Model Canvas and Collaborative Sketching enabled business model ideation, this research shows a clear trade-off between perceived creativity, which has been identified as one of three core requirements for the development of novel business model ideas in Chapter 2, and structure. Teams that developed business model ideas with Collaborative Sketching felt more creative compared to teams working with the Business Model Canvas, while teams working with the Business Model Canvas felt restricted by the structure and less creative. However, the structure of the canvas facilitated the assessment of the current situation and the identification of the business model parts that needed to be changed. Furthermore, teams working with the Business Model Canvas also remained skeptical about the quality of the generated ideas.

6.3. Practical Implications

Chesbrough (2010: 362) argued that “business model innovation is vitally important, and yet very difficult to achieve”. Nonetheless, this research offers initial recommendations for practitioners on how to facilitate the generation of novel business model ideas through visual idea generation methods.

First, there are methods specifically designed for the generation of business model ideas, such as the Business Model Canvas, and general idea generation methods, which are nevertheless suitable for the generation of business model ideas. The framework developed in Chapter 2 facilitates the selection of suitable methods and proposes a set of six methods that managers could easily apply without much training.
Second, this research suggests to include knowledge from different sources, and hence, employees from different departments, such as marketing, sales, control, and production, in business model ideation sessions.

Third, this research shows how visual ideation methods support the generation of novel business model ideas but at the same time that visual ideation teams may perceive the idea generation process to be less enjoyable compared to Brainstorming groups. Since teams employing visual ideation methods are nevertheless satisfied with the results, managers should promote the use of visual ideation methods and bear in mind that teams may need time to get used to these new methods.

Fourth, this research reports trade-offs, notably between creativity and structure. Hence, while the Business Model Canvas provides more structure and guidance by creating the ability to fill in the nine boxes (Gibson, 1977); the canvas may also lead to a lock-in and make it difficult for the team to get out of the box again. Specifically, teams reported that they felt restricted by the fixed structure and experienced difficulties in developing ideas. Teams using sketching reported that they felt overall more creative; however, those teams also experienced difficulties using sketching instead of words to describe their ideas at the beginning of the idea generation session. Managers thus need to decide whether to foster creativity or provide structure, dependent upon their particular situation and firm culture, and select the ideation method accordingly. Furthermore, the insecurity of untrained managers could be overcome with idea generation training, which has been reported to have positive effects on idea generation in teams (Baruah & Paulus, 2008).

Fifth, the case study research provides further findings on virtual teams working on idea generation tasks and suggests that over time, virtual teams may face lasting conflicts, but that the generated ideas may be of equally high quality when compared to the ideas of face-to-face groups (Chapter 5). This is an important finding, as firms in a globalized economy may not be able to establish face-to-face business model ideation sessions. Yet, managers need to expect conflicts, but should keep in mind that the results can be expected to be just as good.

Sixth, the case study research also suggests that practitioners should start early to visualize their ideas to gain feedback, communicate their ideas, and improve them. Even simple sketches, such as those developed in the experiments in Chapters 3 and 4,
are idea prototypes that enable innovation teams to improve not only the idea generation process, but also the outcome.

Seventh, while five of the suggested methods can be applied during a single day, Design Thinking should be given 2-3 months for teams working full-time to allow for sufficient results. Hence, it is important for managers to note that the granularity of the delivered ideas will differ depending on which method is selected. While all methods but Design Thinking lead to the quick generation of ideas, Design Thinking teams generate one final idea that has been tested and refined multiple times (and will nevertheless require further refinement before being implemented); thus, the final prototype will be of higher resolution compared to all other ideas developed in one-day idea generation sessions (Vetterli et al., 2011). Hence, the methods presented and tested in this thesis are suitable for the beginning of business model innovation.

Finally, practitioners may find inspiration not only to explore but also to experiment with different visual idea generation methods to tackle any wicked and ill-defined problems they are facing, even beyond the development of novel business model ideas. Visualizations may offer very effective support for collaboration and communication in teams!

6.4. Methodological Implications

In the following section, the methodological implications, as derived from the research articles in this dissertation, are discussed.

This thesis has relied on a mixed-methods approach, using three methods to answer the research questions, namely, a literature review, experiments, and case studies, thus combining both qualitative and quantitative methods. The choice of a mixed-methods approach was driven by the conviction that a particularly complex research objective: to identify and test visual methods to develop novel business model ideas, requires the combination of several research methods. Experiments allow for the assessment of the visual ideation methods in a “clinical” environment (Brosius et al, 2005), which fosters the understanding of the mechanisms that drive visual business model ideation. The clinical environment is at the same time a limitation, as it does not consider contextual factors limiting external validity. This limitation is mitigated by studying Design Thinking, the most complex idea generation method, in case studies, which offer rich
contextual information on the ideation process (Brachos et al., 2007; Metcalfe et al., 2005). Yet, case studies cannot offer the advantage of the controlled setting of experiments. In combination, the articles in this thesis offer a balanced initial assessment of three visual ideation methods identified in the systematic literature review.

Extant business model innovation research has used literature reviews in a traditional fashion (Mahadevan, 2000; Morris et al., 2005): to summarize the state-of-the-art and to identify questions and directions for further research. This dissertation instead used a literature review in Chapter 2 to answer a specific research question: Which methods are suitable for generating business model ideas in incumbent firms?

Based on the reviewed literature, a framework was built to identify and select visual ideation methods for the specific task of generating novel business model ideas in firms. Thus, this dissertation shows that literature reviews can be employed not only to formulate new research questions, but also to answer existing academic and practically relevant questions, and thereby to encourage other researchers to consider such a methodological approach.

This research has applied another research method so far not used in business model research: By reporting the results of experiments in Chapters 3 – 4, this thesis has broadened the research methods used in the field of business model innovation. So far, business model innovation research has generated data mostly by relying on case studies (Afuah & Tucci, 2000), such as the well-known case study of business model innovation at Hilti (Meehan & Baschera, 2002), when looking into different industries (Sabatier et al., 2010; Schrage, 1999) or when focusing on specific aspects of business model innovation, such as technology (Calia et al., 2007; Chesbrough, 2007; Chesbrough & Rosenbloom, 2002; Pateli & Giaglis, 2005).

Yet, experiments are a well-established research method in the idea generation literature (Kulkarni, 2000; Shah, 1998; Shah et al., 2000) and in visualization research (Bresciani & Eppler, 2009; Comi & Eppler, 2011; van den Braak et al., 2006). However, unlike most idea generation experiments, the experiments conducted for this thesis built, for the most part, on experiments with experienced managers and not just student samples (Silver et al., 1994). Thus, the choice of experiment subjects both enhanced the generalizability of the results and their practical relevance.
Chapter 6

Case studies are often used in business model innovation research (Chesbrough, 2007; Meehan & Baschera, 2002; Pateli & Giaglis, 2005) as business model innovation is a complex phenomenon that can usefully be studied in the context where the phenomenon took place. Yet in this research, the case studies could be conducted only ex-post, that is, after the business model innovation had occurred, as in the case of Hilti (Meehan & Baschera, 2002). However, in contrast to the Hilti case study, this research conducted case studies that accompanied the development of a novel business model idea in teams from the very beginning and added the experimental element of different tasks leading to the generation of different visual prototypes. Thereby, variance has been introduced with respect to the tasks and the outcome to elaborate on specific differences and similarities of the task to develop a novel business model in comparison to other innovation tasks. Therewith, the three case studies reported in Chapter 5 differ from previous business model innovation case studies. Of course, a logical progression would be for the visual ideation methods to be applied in firms as well to provide a realistic environment as it has to be noted that the innovation teams comprised students working in a university environment and not employees of the firms that contributed the innovation tasks.

In sum, this research (a) applied the literature review to answer a specific research question and generate new knowledge; (b) for the first time, conducted experiments in business model innovation research; (c) and used case studies in a novel way to generate insights into how the very beginning of business model innovation can be facilitated with visual methods.

6.5. Limitations and Future Research

This thesis offers a framework for the selection of visual business model ideation methods and provides the first experimental and case study evidence of the benefits of applying visual ideation methods to develop novel business model ideas in teams.

First, as the sample size was limited in the experimental studies (Chapter 3 -4), the results should only be generalized with caution,¹ and more studies are required to provide a comprehensive understanding of the effects of visualization on idea generation in general and on business model ideation specifically. The limited sample

¹ Yet, according to Yin (2003), the small sample size does not limit the generalizability of the case study research in Chapter 5, as case studies are not concerned with statistical generalizability, but theoretical generalizability.
was drawn from a limited population of managers in Switzerland and Finland; hence, the generalizability of the findings to other contexts needs to be established in future research.

Nonetheless, future research should not only replicate the experiments conducted, but also include the test of the other visual idea generation methods identified in Chapter 2. Future experiments and case studies may also “fine tune” the methods, as suggested by Shah and colleagues (2000). For example, the methods could be enhanced by extending the number and duration of circulations for Collaborative Sketching, as suggested by Shah and colleagues (2000: 381), or could be conducted with and without electronic support to build on an important idea generation research stream (Aiken et al., 1996; DeRosa et al., 2007).

Second, it may also be interesting to gain a better understanding of how the application of visual idea generation methods improves with training. For example, Gist (1989) evaluated the impact of a training method based on cognitive modeling on self-efficacy and performance in teams by using both idea quantity and idea diversity as output measures in an experimental study. This research has not controlled for familiarity with either method; it was known only that everyone was familiar with Brainstorming, the control condition. Hence, this research did not examine how training affects the performance of the teams. Research has shown that training has a positive effect on the productivity of the teams (Grossman & Wiseman, 1993) and the quality of the generated ideas in teams (Baruah & Paulus, 2008; Gist, 1989), which could also be observed in the Design Thinking case studies reported in Chapter 5.

Third, experimental research is prone to limitations regarding its external validity, as the clinical environment may lead to artificial results (Brosius, et al., 2005). In the experiments in this thesis, the participants were randomly assigned to teams; however, it is unlikely this would be repeated in firms, where, in order to foster the implementation of the selected business model ideas, specific employees from different functions in the firm would need to be included. Hence, case studies are a promising approach to assess visual business model ideation methods in “real” teams. However, the subjects of the experiments were, for the most part, experienced managers. The ideation methods were therefore tested among the target group of business model ideation methods, which further enhances the relevance of the results.
Chapter 6

To enhance external validity, it is a common strategy to collect additional qualitative data and to use data triangulation or "between method triangulation" (Denzin, 1978, p. 301ff). For the two experimental articles in Chapter 3 and Chapter 4, data triangulation has not yet been conducted, as the main goal was to understand the differences between visual idea generation methods in a clinical environment without further factors influencing the outcome. However, prior to the experiments, qualitative data were collected by interviewing practitioners to understand how firms (both entrepreneurial and established firms) employ business model idea generation. This data was used to refine the set-up of the experiments. Furthermore, visual focus groups have been recommended to assess the performance and the boundary objects generated in the idea generation sessions (Bischof et al., 2011). While the case studies on Design Thinking provided rich data on team processes and outcomes (Chapter 5), future research may provide even more contextual information by conducting visual focus groups of teams and/or experts (Bischof, et al., 2011) using the developed visual artifacts as the center of discussion to gain further insights into their role as boundary objects (Bechky, 2003a, 2003b) in visual idea generation activities.

Additionally, besides improving the external validity of the experiments with visual focus groups, future research may also apply the six business model ideation methods in firms. Participatory observation and action research (Argyris & Schon, 1991) may be suitable methods to transfer the methods into enriched contexts.

Fourth, future research may further examine how different visual idea generation methods facilitate the selection of the best developed idea(s) for further refinement and implementation. This research generated subjective data on the process and outcome of visual ideation sessions in the experiments, and subjective and objective data in the Design Thinking case studies. Building on the research of Girotra and colleagues (2010), it is known that overall, it is the quality of the best idea generated that is most important for a firm aiming to change the current business model. Hence, future research may collect both objective and subjective data in experiments, for example, through expert ratings (Amabile et al., 1996; Amabile, 1983, 1988, 1996), to understand the impact of the process on the selection and quality of the final idea. Based on this research, one could expect a difference between the selected visual business model ideation methods, as some visual idea generation methods guide the teams towards the combination of their ideas and thus towards the selection of one or two final ideas, as in Design Thinking (Chapter 5), while the five other idea generation methods identified in Chapter 2 have no built-in selection mechanism.
Chapter 6

Fifth, this research has reported a trade-off between frozen and fluid forms of visualizations; hence, by the combination of different visual ideation methods may offer superior overall effectiveness. In Chapter 3, this thesis reported on a study where sketching and objects were used for the projection and communication of knowledge (Eppler et al., 2011), which is a first step towards combining methods. In addition, Collaborative Sketching (Shah, et al., 2001) could be combined with the more formal and restricting, but thus also more focused, visualization of the Business Model Canvas (Osterwalder & Pigneur, 2010). In this way, some of the blocking and limiting effects of methods that rely on Brainstorming techniques might be avoided (Nijstad et al., 2003; Nijstad & Stroebe, 2006), while at the same time joint creativity could be facilitated through sketching (Bilda & Demirkan, 2003). This could ultimately lead to the further development of existing methods. Furthermore, future research on the differences between fluid and frozen visualizations may also be used to refine the selection framework developed in Chapter 2.

Finally, this research has focused on idea generation in teams in existing firms; hence, it would be beneficial for future studies to investigate the validity of the findings in other domains, such as start-ups, or education (Hoffmann & Eppler, 2012). The limitations of the individual research articles are outlined in more detail in the respective sections of Chapters 2 – 5.

6.6. Conclusion

The objective of this thesis was to advance the understanding of how different visual idea generation methods can support the very beginning of business model innovation, i.e., the generation of novel business model ideas, in teams. This thesis has provided four contributions in this respect. First, based on a review of business model innovation and idea generation literature, this dissertation develops a framework for the systematic identification and selection of visual idea generation methods. Applying this framework to a comprehensive pool of idea generation methods from existing research, this research further proposes six visual ideation methods for the task of business model innovation.

Second, by drawing on boundary objects theory, the findings indicate that different forms of visualization have different impacts on idea generation in teams. While, overall, the use of visual artifacts is highly promising, there are considerable
differences regarding the visualization type used. The structure provided by “frozen” visual templates facilitates the definition of the current business model and the identification of areas in need of change. However, this very structure also limits the creative ability of the team. Fluid visualizations, such as those developed in Collaborative Sketching, foster creativity through the ambiguity of the individually developed sketches. However, especially for teams without exposure to sketching in their everyday work, the fear of failure may seriously limit their participation in the idea generation process. Hence, visual idea generation methods are not without disadvantages, and these need to be carefully assessed and compared to more traditional approaches to develop novel business model ideas before selecting an idea generation method.

Third, Design Thinking has so far mostly been applied to develop product ideas and, more recently, service innovations. This research highlights its opportunities for business model innovation tasks in both virtual and face-to-face teams and reports that teams develop high quality ideas, but face notable challenges in the process. Thus, the teams require intensive coaching.

Developing novel business models will remain a challenging task for firms and an area of interest for researchers from different areas. This research has contributed initial insights into the opportunities of visual idea generation methods, suggested combining research from different areas, and has offered ideas on how to select and test methods, as well as on what impact different forms of visualization have on the generation of novel business model ideas in teams. Following a triangulation strategy in future research to enrich both theory building with inductive research as well as hypothesis testing with deductive research will be of great benefit for the research topic.

6.7. References


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Curriculum Vitae

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