

NEW BUSINESS MODELS THROUGH COLLABORATIVE IDEA GENERATION

MARTIN J. EPPLER^{*}, FRIEDERIKE HOFFMANN[†]
and SABRINA BRESCIANI[‡]

*University of St. Gallen, MCM Institute
Blumenbergplatz 9, 9000 St. Gallen, Switzerland*

**martin.eppler@unisg.ch
†friederike.hoffmann@unisg.ch
‡bresciani.sabrina@gmail.com*

Generating novel and sustainable business model ideas is a crucial yet challenging innovation task. A growing body of literature shows that artefacts, 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 artefacts 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 artefacts (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 artefacts can have the power to shape team work for innovation tasks.

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

Introduction

Generating innovative and sustainable business models is one of today's most challenging tasks for management teams (Chesbrough, 2006; Christensen and Raynor, 2000) and at the same time continuing business model innovation is a key source of competitive advantage (Mitchell and Coles, 2003, 2004). This study

[†]Corresponding author.

focuses on the idea generation phase as the first crucial step towards developing a new business model. Idea generation requires effective team collaboration (Garfield *et al.*, 2001; Maccrimmon and Wagner, 1994; Briggs *et al.*, 2003) 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 (Sutton and Hargadon, 1996; Rietzschel *et al.*, 2006), 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 and 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 (2009), 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, 2006:20). Research on idea generation has long recognized the importance of the nature of the task on team performance (Straus and McGrath, 1994:88).

The task of developing new business model ideas is recognized as especially complex (Chesbrough, 2010; Doganova and 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 artefacts in the form of templates (Henderson, 1991), such as the business model innovation canvas (Osterwalder and Pigneur, 2009). Second, it has been noted that sharing, creating and integrating knowledge across *epistemic boundaries* (Gavetti and Levinthal, 2000) are required for successful business model idea generation. They may be achieved through an information pooling process (Carlile, 2002, 2004; Dougherty, 1992; Peterovic *et al.*, 2001) and from interacting with knowledge sources both inside and outside the team (Harris and Woolley, 2009).

In the specific context of business model innovation, the potential benefits of using artefacts for facilitating innovation have not yet been investigated extensively. The template artefact developed by Osterwalder and Pigneur (2009) is a prominent

example of such an artefact 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 artefact (Kolfshoten *et al.*, 2010), we aim to understand how different artefacts, 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 *artefacts* in facilitating group innovation processes has been emphasized (Jacobs and Heracleous, 2007; Heracleous and Jacobs, 2005; Nicolini *et al.*, 2011; Schrage, 2000). Artefacts which are used to support idea generation may range from “mundane office objects to plastiline, to construction toy materials” (Jacobs and Heracleous, 2007:80), 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 artefacts may support idea generation for business model innovation tasks in groups, by testing idea generation methods which explicitly use artefacts to foster collaboration.

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 and Kosonen, 2010). 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 and 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 (2009). 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 modelling” (Chesbrough, 2010:359). 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, 2010:359). 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 (2009) template is more widely used in practice, we empirically investigate their template in comparison with other artefact-based idea generation methods.

Recent research on innovation argues for a participatory approach towards innovative idea generation (Castiaux and 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 and 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 and Seibold, 1999) while equalizing participation (Okhuysen and Eisenhardt, 2002).

Artefacts as Boundary Objects

This study aims at contributing to the innovation and business model innovation literature by proposing to study the effect of artefacts 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 artefacts 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 and 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 and Griesemer, 1989), which enhance teamwork and knowledge development (Engeström and 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 (Hales and Tidd, 2009:554; Ewenstein and Whyte, 2007:693), such as the business model canvas (Osterwalder and Pigneur, 2009). 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 artefacts — such as different objects, templates and sketches — can enhance collaboration and creativity in innovation tasks.

Research Model and Execution of the Study

We propose a model of the effects of artefacts on team processes in developing new business model ideas. We posit that artefacts have a positive impact on team collaboration, creativity and on the decision to adopt the developed business model idea (Fig. 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 artefacts. 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 and Jacobs, 2005; Schrage, 2000) in combination with sketching (Van der Lugt, 2002), and (3) A template specifically developed for business model innovation (Osterwalder and Pigneur, 2009).

In the following, we motivate the individual hypotheses of our proposed model, which posit that the artefact used by a group for facilitating business model innovation, affects *collaboration* (Kickul and Neumann, 2000; Stevens and

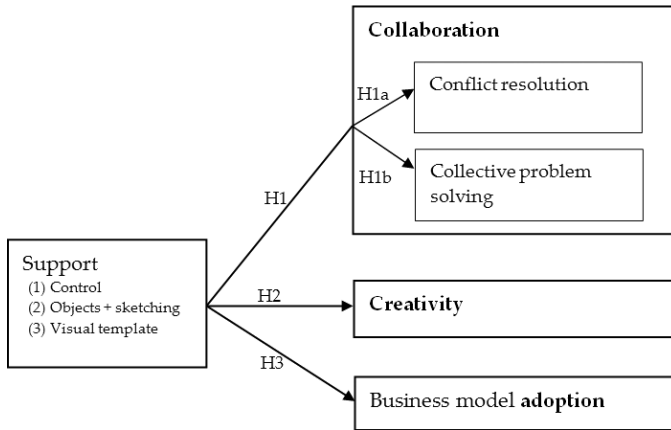


Fig. 1. Research model.

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 and Campion, 1994), which distinguishes different facets of interpersonal requirements for team collaboration including conflict resolution and collaborative problem solving. Following Stevens and Campion (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 artefacts, compared to a control condition without artefacts, has a positive impact on collaboration.

Hypothesis 1a: Facilitating business model innovation with artefacts, compared to a control condition without artefacts, has a positive impact on *conflict resolution*.

Hypothesis 1b: Facilitating business model innovation with artefacts, compared to a control condition without artefacts, 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 and Griesemer, 1989). Warr and O'Neill (2007) found that creativity tools support the “creation, dissemination and refinement of boundary objects” (Warr and O'Neill, 2007:128), following research conducted by Fischer (1999). Stanfors, Tanner *et al.* (2004) elaborate on the enabling mechanisms of artefacts for social creativity by following research of Bennis and Biederman (1977). Hence, we posit that:

Hypothesis 2: Facilitating business model innovation with artefacts, compared to a control condition without artefacts, 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 artefacts affects the confidence in the business model ideas developed. This leads to the hypothesis that:

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

We assume that different types of artefacts (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 artefacts for generating new business models and measure their perceived collaboration, perceived creativity and willingness to adopt the business model idea that they have developed.

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 and Jacobs, 2005; Schrage, 2000) in combination with sketching with chalks (Van der Lugt, 2002) (see Figs. 2 and 3), and (3) A treatment condition with a business model template (Osterwalder and Pigneur, 2009) in a mapping software environment (see Fig. 4). We have selected these conditions as they represent a wide spectrum of approaches for business model idea



Fig. 2. Office and toy objects.

generation. The use of PowerPoint as an idea gathering method represents a traditional *ad-hoc* documentation method used in firms. Therefore, we used PowerPoint supported idea generation to match the status-quo in firms and use this condition as our control condition. The participants brainstormed new business

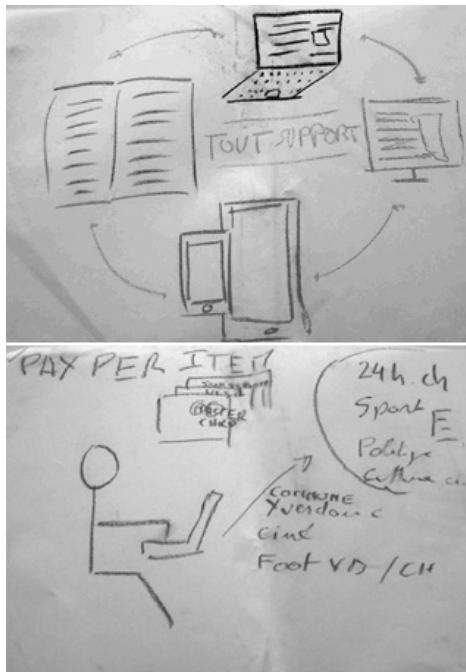


Fig. 3. Examples of early sketches.

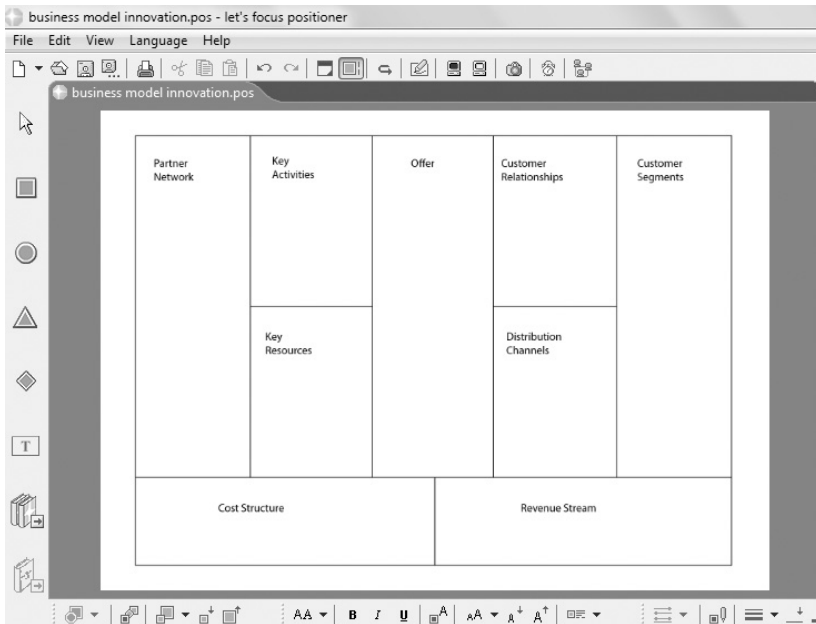


Fig. 4. Business model innovation canvas in a software environment (adapted from Osterwalder and Pigneur, 2009:44).

model ideas and the facilitator kept track of the ideas on an (initially) empty PowerPoint slide.

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 and Champion, 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 (Fleener and Taylor, 2004; Hocevar, 1981). We are interested in understanding the process of idea generation with methods relying on artefacts, and ask participants directly how they perceived the idea generation process when using their specific artefacts. 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.

Findings

The results indicate that using the business model innovation template (Osterwalder and Pigneur, 2009) 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 and 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).

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 artefacts in comparison to the control condition, we also conducted planned comparisons (Tables 2–3). 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

Table 1. Mean comparison.

Measures	(1) Control	(2) Objects and Sketches	(3) Template
Collaboration (KSA total)	5.21 (0.92)	4.95 (1.15)	5.91 (0.74)
KSA Conflict Resolution	5.00 (1.43)	4.58 (1.44)	5.79 (0.83)
KSA Collective Problem Solving	5.37 (0.70)	5.33 (1.11)	6.04 (0.72)
Perceived Creativity	4.90 (0.91)	5.14 (0.71)	3.95 (1.04)
Business Model Adoption	0.95 (0.22)	1.00 (0.00)	0.44 (0.52)

Table 2. ANOVA and planned comparison results.

	Collaboration (KSA)	<i>p</i>	Creativity	<i>p</i>	Business Model Adoption	<i>p</i>
ANOVA	<i>F</i> = 3.348	.045*	<i>F</i> = 5.454	.008*	Chi ² = 15.607	.000**
Objects vs. Control	<i>t</i> = -0.719	.476	<i>t</i> = 0.753	.456		.431
Template vs. Control	<i>t</i> = 2.014	.051	<i>t</i> = -2.742	.009*		.002*
Template vs. Objects	<i>t</i> = 2.468	.018*	<i>t</i> = -3.122	.003*		.003*

Note: *indicates results significant at < .05 and ** indicates results significant at < 0.01 level.

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 artefacts 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 artefacts (*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.

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* = .081). We find a significant

Table 3. ANOVA and planned comparison results for KSA scale facets.

Measures	KSA perceived confrontation avoidance facet	<i>p</i>	KSA perceived collaborative problem solving facet	<i>p</i>
ANOVA	<i>F</i> = 2.700	.079	<i>F</i> = 2.682	.081
Object vs. Control	<i>t</i> = -0.869	.390	<i>t</i> = -0.166	.869
Template vs. Control	<i>t</i> = 1.651	.107	<i>t</i> = 2.077	.044*
Template vs. Objects	<i>t</i> = 2.276	.028*	<i>t</i> = 1.986	.054

Note: *indicates results significant at < .05 level.

difference between subjects using the template, which report higher collaborative problem solving, compared to the control condition ($p = .044$).

Hypothesis 2 is not confirmed, although the results indicate a significant difference ($p = .008$) between the perceived creativity of subjects using artefacts 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 ($p = .002$) and subjects who used toy objects ($p = .003$).

In conclusion, contrasting the two treatment conditions, we find a clear but surprising pattern: different types of artefacts 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 and 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.

Contribution

Theoretical implications

In this study we propose a model to capture relevant dimensions of the effects of artefacts for supporting collaborative business model innovation. We illustrate its application and find that artefacts 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 and Cagan, 1996). Formal constraints and guidance of the collaborative process are useful for improving effectiveness (SunWolf and Seibold, 1999) and fostering participation (Okhuysen and Eisenhardt, 2002).

Teams using objects in combination with sketching find their collaboration more creative, as the switch between different visual work modes (configuring, storytelling and sketching) allows for both distancing and abstracting (Doz and Kosonen, 2010). The study further adds to the boundary object literature and shows that artefacts 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 and 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 artefacts 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).

Practical implications

Our results suggest that organizations may benefit from employing the template developed by Osterwalder and Pigneur (2009) 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 artefacts used to support innovation and group knowledge work. It can help to guide decisions on the selection of artefacts for enhancing different aspects of group work, such as collaboration or creativity.

In general, the use of artefacts 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 artefacts 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 artefacts, with more structured methods, such as templates, to find novel business model ideas.

Conclusion

This study proves that artefacts 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 artefact-mediated interactions, showing that using visual artefacts, 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 artefacts on knowledge work and innovation in organizations in more detail.

Future research should focus on the nature of the visual artefact 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, 1983, 1988, 1996; Amabile *et al.*, 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 artefacts have the potential to significantly affect collaborative and creative processes and their perception by team members.

References

- Aiken, M, M Vanjani and J Paolillo (1996). A comparison of two electronic idea generation techniques. *Information and Management*, 30(2), 91–99.
- Amabile, T (1983). *The Social Psychology of Creativity*. New York: Springer-Verlag.
- Amabile, T (1988). A model of creativity and innovation in organizations. *Research in Organizational Behavior*, 10(1), 123–167.
- Amabile, T (1996). *Creativity in Context: Update to the Social Psychology of Creativity*. Boulder, CO: Westview.
- Amabile, T, R Conti, H Coon, J Lazenby and M Herron (1996). Assessing the work environment for creativity. *Academy of Management Journal*, 30, 1154–1184.
- Ariely, D (2009). *Predictably Irrational: The Hidden Forces that Shape Our Decisions*. New York: Harper Perennial.
- Auer, C and M Follack (2002). Using action research for gaining competitive advantage out of the internet's impact on existing business models. *Proceedings of the 15th Bled Electronic Commerce Conference eReality: Constructing the eEconomy*, Bled, Slovenia, 767–784.
- Baden-Fuller, C and S Winter (2005). *Replicating Organizational Knowledge: Principles or Templates? (No. 2005–15)*. Jena, Germany: Max Planck Institute of Economics, Evolutionary Economics Group.
- Bennis, W and P Biederman (1977). *Organizing Genius: The Secrets of Creative Collaboration*. New York: Perseus Books.
- Boland, R and R Tenkasi (1995). Perspective making and perspective-taking in communities of knowing. *Organization Science*, 6(4), 350–372.
- Briggs, R, G-J van De Vreede and J Nunamaker (2003). Collaboration engineering with thinklets to pursue sustained success with group support systems. *Journal of Management Information Systems*, 19(4), 31–64.
- Brown, K and J Cagan (1996). *Grammatical Design and Bounded Creativity*. Technical Report AUCS/TR9602, Department of Computing Science, University of Aberdeen, United Kingdom.
- Brown, V, M Tumeo, T Larey and P Paulus (1998). Modeling cognitive interactions during group brainstorming. *Small Group Research*, 29(4), 495–526.
- Carlile, P (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization Science*, 13(4), 442–455.
- Carlile, P (2004). Transferring, translating, and transforming: An integrative framework for managing knowledge across boundaries. *Organization Science*, 15(5), 555–568.

- Castiaux, A and S Paque (2009). Participative innovation: When innovation becomes everyone's business. *International Journal of Entrepreneurship and Innovation Management*, 10(2), 111–121.
- Chen, Z (1999). Retrospective analysis for knowledge-based idea generation of new artifacts. *Knowledge-Based Systems*, 12(7), 333–339.
- Chesbrough, H (2006). *Open Business Models: How to Thrive in the New Innovation Landscape*. Boston, MA: Harvard Business School Press.
- Chesbrough, H (2010). Business model innovation: Opportunities and barriers. *Long Range Planning*, 43(2/3), 354–363.
- Christensen, C and M Overdorf (2000). Meeting the challenge of disruptive change. *Harvard Business Review*, 78(2), 66–76.
- Connolly, T, R Routhieaux and S Schneider (1993). On the effectiveness of group brainstorming — Test of one underlying cognitive mechanism. *Small Group Research*, 24(4), 490–503.
- Doganova, L and M Eyquem-Renault (2009). What do business models do? Innovation devices in technology entrepreneurship. *Research Policy*, 38(10), 1559–1570.
- Dougherty, D (1992). Interpretive barriers to successful product innovation in large firms. *Organization Science*, 3(2), 179–202.
- Doz, Y and M Kosonen (2010). Embedding strategic agility: A leadership agenda for accelerating business model renewal. *Long Range Planning*, 43(2/3), 370–382.
- Dul, J and C Ceylan (2011). Work environments for employee creativity. *Ergonomics*, 54(1), 12–20.
- Engeström, Y and F Blackler (2005). On the life of the object. *Organization*, 12(3), 307–330.
- Ewenstein, B and J Whyte (2007). Beyond words: Aesthetic knowledge and knowing in organizations. *Organization Studies*, 28(5), 689–708.
- Fay, D, C Borrill, Z Amir, R Haward and M West (2006). Getting the most out of multidisciplinary teams: A multi-sample study of team innovation in health care. *Journal of Occupational and Organizational Psychology*, 79(4), 553–567.
- Fiol, CM and A Huff (1992). Maps for managers: Where are we? Where do we go from here?. *Journal of Management Studies*, 29(3), 267–285.
- Fischer, G (1999). Domain-oriented design environments: Supporting individual and social creativity. *Proceedings of the Computational Models of Creative Design IV, Key Centre of Design Computing and Cognition*, Sydney, Australia, 83–111.
- Fleener, J and S Taylor (2004). The assessment of creativity. In Jay Thomas and Michael Hersen (Eds.), *Comprehensive Handbook of Psychological Assessment*. Hoboken, New Jersey: Wiley, pp. 75–84.
- Fritscher, B and Y Pigneur (2010). Supporting business model modelling: A compromise between creativity and constraints. In D. England *et al.* (Eds.), *Proc. 8th International Workshop on Task Models and Diagrams*, Lecture Notes in Computer Science 5963. New York: Springer, pp. 28–43.
- Garfield, M, N Taylor, A Dennis and J Satzinger (2001). Research report: Modifying paradigms — individual differences, creativity techniques, and exposure to ideas in group idea generation. *Information Systems Research*, 12(3), 322–333.

- Gibson, J (1977). The theory of affordances. In Robert Shaw and John Bransford (Eds.), *Perceiving, Acting, and Knowing — Toward an Ecological Psychology*. New York: Lawrence Erlbaum Associates, pp. 67–82.
- Gibson, J (1979). *The Ecological Approach to Visual Perception*. Boston, MA: Houghton Mifflin.
- Girotra, K, C Terwiesch and K Ulrich (2010). Idea generation and the quality of the best idea. *Management Science*, 56, 591–605.
- Hales, M and J Tidd (2009). The practice of routines and representations in design and development. *Industrial and Corporate Change*, 18(4), 551–574.
- Harris, E and R Woolley (2009). Facilitating innovation through cognitive mapping of uncertainty. *International Studies of Management and Organization*, 39(1), 70–100.
- Henderson, K (1991). Flexible sketches and inflexible data bases: Visual communication, conscription devices, and boundary objects in design engineering. *Science, Technology and Human Values*, 16(4), 448–473.
- Heracleous, L and C Jacobs (2005). The serious business of play. *MIT Sloan Management Review*, 47(1), 19–20.
- Heracleous, L and C Jacobs (2008). Crafting strategy: The role of embodied metaphors. *Long Range Planning*, 41(3), 309–325.
- Hocevar, D (1981). Measurement of creativity: Review and critique. *Journal of Personality Assessment*, 45, 450–464.
- Hoegl, M, M Gibbert and D Mazursky (2008). Financial constraints in innovation projects: When is less more? *Research Policy*, 37, 1382–1391.
- Jacobs, C and L Heracleous (2007). Strategizing through playful design. *Journal of Business Strategy*, 28(4), 75–80.
- Johnson, M, C Christensen and H Kagermann (2008). Reinventing your business model. *Harvard Business Review*, 86(12), 50–59.
- Kickul, J and G Neumann (2000). Emergent leadership behaviors: The function of personality and cognitive ability in determining teamwork performance and ksas. *Journal of Business and Psychology*, 15(1), 27–51.
- Kolfschoten, G, G-J van De Vreede, R Briggs and H Sol (2010). Collaboration “engineerability”. *Group Decision Negotiation*, 19, 301–321.
- Lawson, B (2006). *How Designers Think: The Design Process Demystified*. Oxford: Architectural Press.
- Maccrimmon, K and C Wagner (1994). Stimulating ideas through creativity software. *Management Science*, 40(11), 1514–1532.
- Magretta, J (2002). Why business model matter. *Harvard Business Review*, 80(5), 86–92.
- Markides, C (2006). Disruptive innovation: In need of better theory. *Journal of Product Innovation Management*, 23(1), 19–25.
- McGrath, R. Business models: A discovery driven approach. *Long Range Planning*, 43(2–3), 247–261.
- Mitchell, D and C Coles (2003). The ultimate competitive advantage of continuing business model innovation. *The Journal of Business Strategy*, 24(5), 15–24.

- Mitchell, D and C Coles (2004). Business model innovation breakthrough moves. *The Journal of Business Strategy*, 25(1), 16–26.
- Nicolini, D, M Jeanne and J Swan. Understanding the role of objects in cross-disciplinary collaboration. *Organization Science*, (forthcoming).
- Okhuysen, G and K Eisenhardt (2002). Integrating knowledge in groups: How formal interventions enable flexibility. *Organization Science*, 13(4), 370–386.
- Osborn, A (1957). *Applied Imagination: Principles and Procedures of Creative Problem-Solving*. New York: Charles Scribner's Sons.
- Osterwalder, A and Y Pigneur (2009). *Business Model Generation. Handbook for Visionaries, Game Changers, and Challengers*. Hoboken, NJ: John Wiley and Sons.
- Osterwalder, A, Y Pigneur and C Tucci (2005). Clarifying business models: Origins, present, and future of the concept. *Communications of the Association for Information Systems*, 16(1), 1–25.
- Pateli, A and G Giaglis (2005). Technology innovation-induced business model change: A contingency approach. *Journal of Organizational Change Management*, 18(2), 167–183.
- Peterovic, O, C Kittl and R Teksten (2001). Developing business models for ebusiness. *Proceedings of the International Conference on Electronic Commerce*, Munich, 1–6.
- Rietzschel, E, B Nijstad and W Stroebe (2006). Productivity is not enough: A comparison of interactive and nominal brainstorming groups on idea generation and selection. *Journal of Experimental Social Psychology*, 42, 244–251.
- Schrage, M (2000). *Serious Play — How the World's Best Companies Simulate to Innovate*. Boston, MA: Harvard Business School Press.
- Shah, J, N Vargas-Hernandez, J Summers and S Kulkarni (2001). Collaborative sketching (c-sketch) — An idea generation technique for engineering design. *Journal of Creative Behavior*, 35, 168–198.
- Star, S (1989). The structure of ill-structured solutions: Boundary objects and heterogeneous distributed problem solving. In Alan Huhns and Less Gasser (eds.), *Readings in Distributed Artificial Intelligence*. Menlo Park, CA: Morgan Kaufman, 37–54.
- Star, S and J Griesemer (1989). Institutional ecology, “translations” and boundary objects: Amateurs and professionals in Berkeley's museum of vertebrate zoology, 1907–39. *Social Studies of Science*, 19(3), 387–420.
- Stenfors, S, L Tanner and I Haapalinn (2004). *Executive Use of Strategy Tools: Building Shared Understanding through Boundary Objects*. Paper presented at the FeBR Frontiers of e-Business Research, February 2004.
- Stevens, M and M Champion (1994). The knowledge, skill, and ability requirement for teamwork: Implications for human resource management. *Journal of Management*, 20(2), 503–530.
- Stigliani, I (2008). Artefacts and creativity: The role of artefacts during the creative process in a product design firm. *Academy of Management Annual Meeting Proceedings*, 1–6.

- Straus, S and J McGrath (1994). Does the medium matter? The interaction of task type and technology on group performance and member reactions. *Journal of Applied Psychology*, 79(1), 87–97.
- Stroebe, W, M Diehl and G Abakoumkin (1992). The illusion of group effectivity. *Personality and Social Psychology Bulletin*, 18(5), 643–650.
- SunWolf and D Seibold (1999). The impact of formal problem-solving procedures on group processes, members, and task outcomes. In Lawrence Frey, Dennis Gouran and Marshall Poole (Eds.), *The Handbook of Group Communication Theory and Research*. Thousand Oaks, CA: Sage, pp. 395–431.
- Suthers, D (2001). Toward a systematic study of representational guidance for collaborative learning discourse. *Journal of Universal Computer Science*, 7(3), 254–277.
- Suthers, D, R Vatrupu, R Medina, S Joseph and N Dwyer (2007). Conceptual representations enhance knowledge construction in asynchronous collaboration. In C. Chinn, G. Erkens and Sadhana Puntambekar (Eds.), *Proceedings of the Seventh International Computer Supported Collaborative Learning Conference (CSCL 2007)*. Mahwah, NJ: Lawrence Erlbaum Associates, pp. 694–703.
- Sutton, R and A Hargadon (1996). Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly*, 41(4), 685–718.
- Teece, D (2010). Business models, business strategy and innovation. *Long Range Planning*, 43(2–3), 172–194.
- Toubia, O (2006). Idea generation, creativity, and incentives. *Marketing Science*, 25, 411–425.
- Tversky, A (1977). Features of similarity. *Psychological Review*, 84(4), 327–352.
- Van der Lugt, R (2002). Functions of sketching in design idea generation meetings. In Ernest Edmonds, Linda Candy, Terence Kavanagh and Thomas (Eds.), *Proceedings of the 4th Conference on Creativity and Cognition*, United Kingdom: Loughborough, pp. 72–79.
- Warr, A and E O’Neill (2007). Tool support for creativity using externalizations. *Proceedings of the 6th ACM SIGCHI Conference on Creativity and Cognition*. Washington, DC, 127–136.
- Whyte, J, B Ewenstein, M Hales and J Tidd (2007). Visual practices and the objects used in design. *Building Research and Information*, 35(1), 18–27.
- Whyte, J, B Ewenstein, M Hales and J Tidd (2008). Visualizing knowledge in project-based work. *Long Range Planning*, 41(1), 74–92.
- Yunus, M, B Moingeon and L Lehmann-Ortega (2010). Building social business models: Lessons from the grameen experience. *Long Range Planning*, 43(2/3), 308–325.

Copyright of International Journal of Innovation Management is the property of World Scientific Publishing Company and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.