Can the Crowd Do the Job?

Exploring the Effects of Integrating Customers into a Company's Business Model Innovation

Introduction

Sustainable innovations are often characterized by the fact that they emerge from collaborative activities by different actors, meaning they require multiple actors to work together. Joint innovation activities where multiple organizations work together with their stakeholder to pool complementary assets are particularly important for sustainability innovations as Chesbrough's open innovation paradigm illustrates (Chesbrough, 2003).

In 2003, Chesbrough (2003) introduced the term "open innovation" as a concept for innovation where a company interacts strongly with its environment instead of using "closed" innovation processes located only within the research and development division of a firm. In open innovation, which is also referred to as crowdsourcing for innovation (Majchrzak and Malhotra, 2013), organizations pool knowledge, technologies, and other assets from external stakeholders, in particular customers (Chesbrough, 2003). The basic idea behind this concept is that these stakeholders contribute their individual ideas, knowledge, experiences, and strengths to pool complementary assets

(Chesbrough, 2003). Existing literature provides several examples about crowdsourcing constituting a successful approach for solving a huge range of innovation problems (Di Gangi and Wasko, 2009, Di Gangi et al., 2010, Afuah and Tucci, 2012). More recently, literature and practice began to extend this concept to the field of business model innovation (Chiou, 2011, Chesbrough, 2007, Rohrbeck et al., 2013), which is characterized by the cooperation for business model innovation within networks of customers, suppliers, and other divisions of a firm. According to these new theoretical thoughts in literature, companies should use external business models as well as those from their own business development department, plus both internal and external paths to the market in order to advance their business models. The benefits for doing so lie in the assumption that if users are the persons who decide whether or not a new offering represents a suitable way of meeting their needs, then customers should be thought of as a valuable source to initiate exploitable business models (Prahalad and Ramaswamy, 2000, Thomke and Von Hippel, 2002). Consequently, customers are considered as important partners capable of developing products and services by themselves (Dahan and Hauser, 2002, Von Hippel and Katz, 2002).

However, in contrast to other forms of integrating customers into a company's innovation process (e.g., idea generation), the development of new business models implies not only the impression of customer needs or value creation mechanisms (Amit and Zott, 2001), but also the definition of value approbation mechanisms.

Thus, one of the key questions increasingly discussed by academics and practitioners is whether users are capable of generating new business models or are not able to express the solution information required for generating new business models (Rohrbeck

et al., 2013). This paper thus addresses the following research question with the help of empirical validation: How attractive are new business models generated by a crowd of customers compared to new business models generated by a firm's professionals? Additionally, we intend to examine the effects that the integration of such crowds has on the quality of the developed business models.

Drawing on related literature on the quality for creative output, such as new business models developed by customers, this paper proposes that the integration of a customer crowd will improve the quality of the generated business models. Specifically, we propose that in the context of a business model innovation initiative, the integration of customers will improve the novelty, relevance, and elaboration dimensions of the creative output of such an initiative. We tested our model in a real-world study with an eLearning provider that started an open call among its customers to develop new business models in order to commercialize its eLearning services. The findings of this paper are expected to contribute to research and practice concerning customer integration as well as crowd-based business model innovation.

Conceptual Background and Hypothesis Development

This section reviews the relevant concepts and literature on assessing the quality of newly developed business models and user integration. These concepts form the basis for developing our hypotheses. However, before elaborating on the assessment of new business models, we first elaborate on the definitions of the term business model.

When looking at existing literature on business models, most definitions circle around three distinct notions that can be considered as relevant themes in business model re-

search: (1) the expression of the value a company is offering to its customers is regarded as a central aspect of business models and is therefore included in most business model definitions; (2) the mechanisms a company uses in order to deliver this value to their customers are an important part of a business model; (3) so-called value-capturing mechanisms (the processes that a company employs for capturing value when delivering value to its customers) are considered as an essential part of a business model (Zott et al., 2011, Hedman and Kalling, 2003, Relander, 2008). A definition by Osterwalder (2004) matches these three elements and will therefore be used as the working definition in this article. "A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money. It is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network of partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams" (Osterwalder, 2004).

Assessing the quality of newly developed business models

To assess the value and utility of integrating customers into the process of developing new business models, it is necessary to evaluate the generated business models. To the best of our knowledge, currently, there is no scientific publication that provides quantitative measures for evaluating the quality of business models. We therefore looked at related research streams in order to identify measures that would allow for the evaluation of the generated business models. At the end of this process, we came up with three dimensions for evaluating the quality of a business model. In the following, we will discuss these dimensions and elaborate on their capability to measure the three

components of a business model, which were derived when developing a business model definition.

According to creativity research, business models can be interpreted as creative products. Creativity research addressed the aspects of assessing creative products, such as creative ideas, paintings, or music compositions (Amabile, 1996). Research efforts that focus on assessing creative products cover the scale for evaluation and the assessing process itself. Consequently, we consider both aspects as described below.

Quality of creative products is a complex construct. Various metrics consisting of different dimensions for assessing the quality of creative products were discussed in the literature. In order to develop a reliable scale, we searched for work done in creativity research. An extensive literature review was conducted, which identified several relevant papers that were useful for this research. First, all of these papers dealt with empirical evaluation of the quality of creative products. Second, all papers had in common that they used a certain scale for evaluating creative products. According to these criteria, the research team carefully analyzed the scales, particularly the used dimensions, in order to check which dimensions existed and which were appropriable for the development of the metric used for this evaluation.

Previous creativity literature suggests that quality business models are generally characterized as being new and useful (Amabile, 1996, Plucker and Renzulli, 1999). **Novelty** or newness is defined as something being unique, unobvious, or rare (Dean et al., 2006). In the context of innovation, novelty refers to the extent to which the business model has not been previously expressed (Magnusson, 2009). In this study, raters examine how unique the business model is or how uncommon it is in the overall popula-

tion of business models when judging its novelty. In this regard, the novelty dimension can be considered as a proxy for measuring the innovativeness of the value offering that is implied in the developed business models. However, a business model's novelty is not sufficient for being useful.

Usefulness is the extent to which the business model responds to or solves a problem that is tangible and vital (Amabile, 1996, Dean et al., 2006). This dimension is also labeled as a business model's value or *relevance* (Dean et al., 2006, Kristensson et al., 2004). A business model is relevant if it satisfies the goals framed by the problem setter (Dean et al., 2006). In the context of new product development, this frequently refers to a business model's financial potential (Lilien et al., 2002), the strategic importance in terms of enabling competitive advantage (Cady and Valentine, 1999, Lilien et al., 2002), and the customer benefit that a business model endows (Piller and Walcher, 2006). When looking at the components of a business model, relevance can be considered as a proxy for measuring the value creation mechanisms that are implied in the developed business models.

In addition to novelty and relevance, through a thorough review, Dean et al. (2006) identified two other dimensions of quality business models used in previous literature, which are elaboration (specificity) and workability. Thus, another trait of a high quality business model is its *elaboration*, which can be seen as the extent to which it is complete, detailed, and understandable (Dean et al., 2006). This refers not only to a business model's description but also to its maturity (Lilien et al., 2002, MacCrimmon and Wagner, 1994). In the context of new business models, elaboration refers to the extent to which the business model is sufficiently described in order to allow the proper execu-

tion of the value-capturing processes. Business models that are vague or contain unclear causality are less useful than business models that are more specific in these areas (MacCrimmon and Wagner, 1994).

In the following, we examine each of the mentioned quality dimensions and discuss the supposed effects on these dimensions when integrating customers into the process of developing new business models.

Effects of customer integration on the quality dimensions

Literature on integrating customers into the process of developing new business models is very limited, since research on this new phenomenon is just beginning. To date, this stream of literature is more conceptual and descriptive in nature rather than experience-based. For example, in their conceptual work, Rohrbeck et al. (2013) as well as Chiou (2011) describe the nature as well as the basic concept of integration that customers contribute to business model innovation. However, there is an extensive body of literature concerning the integration of customers into other kinds of innovation initiatives.

Novelty

When looking at literature that might deliver an indication about the effects of user integration on the novelty of the developed business models, we found two studies by Kristensson et al. (2004) and Kristensson et al. (2002). In the course of a laboratory experiment, they found that customers of a mobile phone service are capable of generating more novel product concepts than professional developers. In addition, Seti et al (2001) found that customers' influence is positively related to the novelty of new product concepts. In a similar vein, Madhar and Orthiz (2008) examined the nature of creativity in a

service setting. Their results demonstrated that customer input makes significant positive contributions to service-related creativity. Apart from that, Ogawa (1998) found empirical evidence that customers do make important contributions when identifying future market demands. These results are in line with previous literature on customer integration. As Chesbrough (2003) and Cooper (2011) pointed out, the integration of customers when developing new product concepts can cause firms to generate more novel solutions to customers' problems. In this regard, it is important to note that customers who are involved in such innovation initiatives are not primarily motivated by financial returns but by the fact that they expect benefits from using the product or service that is developed (Ogawa, 1998, Riggs and Von Hippel, 1994). Based on these findings, we propose that the integration of customers into a business model development process will have a positive effect on the value that is offered by the developed business models. This is because customers who contribute in such crowdsourcing initiatives often have a clear understanding about a future product or service as well as the value that results from using this product and service. Consequently, our first hypothesis is:

H1:   Business models generated by customers will have a higher amount of novelty than business models generated by company representatives.

Relevance

Relevance is a construct that was studied more extensively in the past. In one of the first studies within the field of user integration, Urban and von Hippel (1988) found that user innovations in the field of computer-aided design are significantly preferred over the best commercially available system. When examining five different innovation communities in the course of an exploratory study, Franke and Shah (2003) found that inno-

vations generated by users display a high commercial attractiveness. In a similar vein, using a sample of users drawn from kite surfing, Franke, von Hippel, and Schreier (2006) also reported that the capability of customers significantly impacts the likelihood of yielding a commercially attractive innovation. These findings are further supported by a study of Morrison, Roberts, and von Hippel (2000), who found that users of an Australian library system frequently modify products in ways that manufacturers of such systems find to be commercially attractive. Even in the field of crowdsourcing, there is some evidence that customers are able to generate commercially attractive innovations. Ogawa and Piller (2006) found that user-generated ideas have a certain commercial potential. Their empirical findings also indicate that some of the products developed on the basis of these ideas outperform traditionally developed products in terms of sales. Baldwin et al. (2006) even argued that innovations generated by users can serve as a starting point for industry development. In this context, customers are seen as a key resource, as they often have an excellent understanding about the potential target markets of a certain product or service. Due to their high product expertise as well as experience, they also know in which ways potential customers want to consume a certain product or service (DiGangi and Wasko, 2009, Bretschneider et al., 2015). As these consumption processes are at the center of the value creation component of a business model, we expect that customer integration will have a positive effect on the value creation mechanisms implied in a new business model. Consequently, we propose:

H2: Business models generated by customers will have a higher amount of relevance than business models generated by company representatives.

Elaboration

When looking at the degree of elaboration that user-generated innovations typically possess, existing literature provides mixed results. On the one hand, studies indicate that it is necessary to possess expert knowledge in a certain field in order to develop feasible business models. For example, Ulrich and Eppinger (2011) argue that it is necessary to possess a certain level of knowledge on how existing solutions work and how they can be modified in order to develop new products. In accordance with these studies, Amabile (1998) constitutes that the technical, procedural, and intellectual knowledge of professional developers is a prerequisite for generating complete product concepts.

On the other hand, there are studies indicating users might be able to contribute solution-based information (von Hippel, 1986). Shah and Tripsas (2007) provide detailed data on how users, who experienced an unsolved need, innovated in order to solve this need and even founded an own business in the course of this innovation process. It therefore seems plausible that users are indeed capable of providing detailed information about how a certain product or service should be brought to market. Because such solution-based information (i.e., information about the processes that a company has to execute in order to capture value from offering a certain value) is an important part of a new business model, the integration of customers into a business model development process might have a positive effect on the developed business models. According to Schrage (1995) as well as Shah and Tripsas (2007), one explanation for this lies in the principle of emergence that can be seen as a result of collaboration between different actors. Emergence occurs when different actors join their individual knowledge,

experiences, and strengths in order to develop a solution that is of higher quality than the solution of each single actor (Schrage, 1995). Therefore, Schrage (1995) and Stoller-Shai (2003) argue that collaboration processes will have better outcomes when actors with a diverse set of skills and knowledge participate in the process. As they argue, this is due to the fact that the different actors complement their individual contributions, and therefore, the elaboration of the developed business models will improve.

We therefore expect:

H3:   Business models generated by customers will have a higher amount of elaboration than business models generated by company representatives.

Study Design

Background of the study

In order to test the hypotheses developed above, we intend to use a real-world study. We therefore identified a firm that met the following criteria: 1) It had to have the need and intention to innovate its business model in a certain product or service area; 2) by default, it had to use its internal professionals to generate new business models; 3) it had to be willing to launch a simultaneous business model development contest in order to collect customer business models; and 4) the company had to be willing and able to evaluate all business models regardless of their source (professionals vs. users) along the dimensions identified above.

We identified Ingenium, a provider for eLearning services, as fulfilling these criteria and willing to collaborate in this project. Based in Germany, Ingenium delivers eLearning solutions to multinational companies from the automotive and banking industries, as well as solutions to energy providers around the world. Traditionally, Ingenium applied various market research techniques to identify unmet consumer needs or related consumer problems, which marketers and service designers then address by generating new business models for the company's services.

Business model development contest

This study relates to an innovation project within which the company tried to extend its eLearning services to new markets. Based on this aim, Ingenium started its regular internal business model development process. Within this internal business model development process, five company representatives met in order to generate new business models with the help of the business model canvas (Osterwalder and Pigneur, 2010). In the course of a one-day workshop, they were able to generate 15 different business models. In parallel, Ingenium launched a virtual community to collect business models created by customers. The customers of Ingenium were invited to join this community and to submit their business models. The incentive for participation was a cash prize for the winning idea. Overall, 97 customers participated in this business model development contest and developed 23 business models via the virtual community. In order to enable their customers to generate new business models, the virtual platform was implemented to cover three main aspects: the community, shared materials, and a business model framework.

Community

The community serves as the foundation of the project in terms of integrating project members into the different stages of the project; thus, a discrete profile page was implemented for each community member. This profile page serves as the virtual representation of a member's identity within the community. On these profile pages, community members can share their personal information with the community. Apart from the member's name and photo, these profile pages also provide the possibility of listing skills and competencies, as well as various work-related experiences. All of this profile information is visible to other community members, as well as being indexed and searchable by the platform's search engine. Thus, whenever the project team needs assistance in working on the different project steps, users with relevant experience and skills are identifiable by using the search engine.

Within the community as a whole, the platform allows forming subgroups consisting of members that work together in a team. We thus provided "team spaces" accessible solely by members of one team. These team spaces basically consist of a page providing team internal communication functions (such as the shoutbox mentioned below) as well as the shared materials mentioned in the following section. The team spaces furthermore allow members to invite other community members to join a team. This invitation function is coupled with the search engine of the platform. This allows teams to search for members who can offer useful or required skills needed to complete a task. To address all members of a group simultaneously, we implemented a so-called "shoutbox" that allows groups to communicate on a many-to-many basis. This shoutbox serves as a chronological list of messages that can be posted and viewed by members

of one group. In order to provide the community members with the possibility of building up direct relationships with other community members, we integrated a function that allows for the establishment of friendships based on the user profiles. This function is implemented by integrating a corresponding button into each user profile that allows for requesting friendship. In order to meet the requirements for allowing communication between community members, we included the function to send and receive personal, one-to-one, asynchronous messages. Each user profile has a button that allows for sending a personal message to a user, which can then be accessed by the receiver in a message inbox on their user profile.

Shared materials

In order to assist community members to develop a shared understanding about the different tasks within a project and to provide them with materials for executing the different business model development tasks, we provided the above-mentioned team spaces. These spaces provide several practitioner guidelines on how to develop new business models, as well as a guiding video considering the development of business models. We also implemented functions to create and share common materials, basically consisting of one or more business models collaboratively developed by the team. Further, we provided community members with a detailed description of the project goals in order to align the members' efforts when developing new business models. The documentation of the project goals was realized by depicting several goals on the start screen of the virtual platform. This ensured that every community member would become aware of the project goals whenever they logged on to the system.

Business model framework

For the support of the actual business model design, we had to implement a business model framework that would allow community members to document their results. For this purpose, we used the business model canvas proposed by Osterwalder and Pigneur (2010). After the framework was selected, we ensured that users would be able to generate different versions of the business model by implementing a collaborative editor. This editor provides a comprehensive revision history that allows for the tracking of every change made by any group member. Thus, all changes are traceable, and can also be reverted on demand. In this way, the whole development process can be documented and the history of the document is preserved. Users were also given the possibility to attach external data without any restrictions of size and format.

The process of developing new business models

When developing the business models, the customers as well as the company experts had the possibility to revise and refine their business models. In the following, we will illustrate this refinement process and discuss the major differences between the two groups. As described in the previous section, the customers of Ingenium were provided with three main functions that were designed in order to facilitate the collaboration among them: (1) the revision of developed business models, (2) a comment function in order to communicate deficits in the developed business models, and (3) a shoutbox for coordinating their efforts. Table 1 illustrates to which extent the customers made use of these functions in the course of the business model development contest.

Insert Table 1 around here

As it can be seen in Table 1, on average five customers contributed to the different business models, which had been developed in the course of the competition. These five members averagely generated 17 revisions when developing the business models. In addition to that, they made on average one comment in order to communicate deficits and made use of the shoutbox five times.

In contrast to that, experts had the possibility to coordinate their efforts continuously, as they were working synchronously on their business models. Because they developed their business models in an analogous setting, we had no possibility to track their collaboration. However, in the course of the workshop, the experts had to check the business model for consistency after finishing every building block. Since the framework they worked with (e.g., the business model canvas) possesses nine building blocks, we assume nine revisions per business model for the expert group.

Evaluation of the developed business models

The quality of the developed business models was assessed by three experts in the field of business model development. All three experts had extensive market and technical knowledge and participated in several business model development projects. They were not aware of the source of the business models (professionals vs. customers). The developed business models were presented to the experts for evaluation in random or-

der, with each business model described on a separate sheet of paper. As a first step, the experts were asked to look at all the business models and to assess whether the business models could be evaluated properly (i.e., they were described in a way that would allow serious evaluation). Before the experts would assess the final quality of ideas in greater detail, they would be given training with regard to the evaluation criteria as well as their definition and proper application (Krippendorff, 2004, Hayes and Krippendorff, 2007). After the individual evaluation, the company experts would be given the opportunity to discuss differences in their assessments and change their individual ratings based on their joint discussion if desired. In order to illustrate how the developed business models looked like, we inserted two sample business models. Figure 1 depicts a business model developed in the course of the expert workshop. Figure 2 illustrates a business model developed by the crowd. Both business models were randomly selected among all business models.

Insert Figure 1 around here

Insert Figure 2 around here

To identify scales that measure the quality of the developed business models, we drew on the creativity literature for its measures. As described in the conceptual background

section, we measured the quality of user-generated ideas in terms of three dimensions, including novelty, relevance, and elaboration. Following previous creativity research, we adopted the consensual assessment technique (CAT) (Amabile, 1996) to assess the quality of the generated business models, a technique which is commonly used to evaluate user-generated content in product innovation (Blohm et al., 2011, Magnusson, 2009, Matthing et al., 2006). We thus obtained data for the three dimensions of idea quality in an aggregated level. Each judge was asked to rate the quality of the user-generated idea according to its novelty, elaboration, and relevance on a scale ranging from 1 (lowest) to 5 (highest). The value for each dimension of the quality of each user-generated idea is calculated by averaging the scores from the judges. The described scales for the expert rating are depicted in Table 2. For evaluation, each business model was inserted into separate evaluation forms, which also contained the scales for idea evaluation. Thus, 38 evaluation forms were handed out to each referee in a randomized order.

Data Analysis

Measurement validity

According to Amabile (1996), reliability of a scale that is used in the scope of Amabile's CAT is good if all judges of the jury evaluate the creative products concerning each dimension almost equally. This means that ratings on each dimension should be analyzed for inter-judge reliability (1996). We checked the inter-rater reliability for our case by calculating intra-class correlation (ICC) coefficients. According to Amabile, ICC coefficients have to be higher than or equal to 0.7 in order to indicate a sufficient degree of inter-

rater reliability (Amabile, 1996). In our case, all ICC coefficients were > 0.7 (see Table 2).

Insert Table 2 around here

Data assessment

When assessing the resulting quality scores, we used a procedure that was proposed by Poetz and Schreier (2012). In the course of this assessment, we first averaged the three experts' scores for each of the three dimensions. In addition, we also created a three-way interaction term (novelty x relevance x elaboration) in order to allow a comparison of the overall quality of business models between the user sample and the expert sample. However, comparing mean differences between the two samples in terms of novelty, relevance, and elaboration (and the interaction of those dimensions) is only one way to analyze the data. From a company's point of view, it would also be highly relevant to know who came up with the best business models, since those business models would be the ones the company would most likely realize. The importance of this analysis can be illustrated by a short example. Let us assume a situation in which the crowd came up with a few promising business models, which are even better than the business models generated by the expert sample. In such a situation, comparing the means of the two samples, one would conclude that users are not capable of generating high quality business models. However, this conclusion would raise the wrong implica-

tions, since the users generated the business models that are most valuable to the company. In order to avoid such wrong implications, we also created three dummy variables where business models assigned a value greater than three (or less than or equal to three) in each dimension and are defined as top (or other) ideas.

Findings

When analyzing the generated data, we first looked at the correlations between each of the quality dimensions. As we found, novelty is positively correlated with relevance (r=0.840) and also positively correlated with elaboration (80.669). Relevance also positively related with elaboration (0.621; all p's < .01). This is in contrast to previous research on innovation management, where customers often struggle to produce new ideas that are novel and highly relevant to the market and are at the same time realistic enough to be implemented by a company (e.g., (Kristensson et al., 2004, Urban and von Hippel, 1988).

In a next step, we compared the mean values of the quality of business models generated by the crowd and that of business models generated by the company's experts. When comparing these mean values, we found that business models created by professionals scored significantly lower in terms of novelty (mean = 2.40) than business models created by users (mean = 3.20; p < .01). We therefore conclude that H1 can be supported. In addition to that, we also found that business models generated by experts scored significantly lower in terms of market relevance (mean = 2.47) than business models generated by the crowd (mean = 3.40; p < .01). We interpret these results as

support for H2. Third, we found that business models created by professionals were not attributed with a significantly lower degree of elaboration than the business models created by the crowd (mean = 2.80 vs. mean = 3.19; p > .10). We therefore conclude that H3 cannot be supported when looking at the results at hand.

We then compared the overall quality index (the three-way interaction term novelty x relevance x elaboration) of the business models within the different samples. Analyzing the overall index, we found that business models generated by experts also score significantly lower (mean = 23.00) than business models generated by the crowd (mean = 29.39; p < .01). When looking at the variances, we found that the quality indexes of the professional business models seem to possess consistently lower variances than the business models generated by the crowd (see Table 3).

Insert Table 3 around here

Next, we compared the top business models with the rest of the business models included in our sample (see Table 4). In this regard, top business models are those that were evaluated higher than three in each of the three quality dimensions. In the course of this analysis, we found that 15 of the 38 business models were considered as novel. This means that the judges rated them with values higher than three in terms of novelty. This rather large amount (39% of all business models were evaluated as novel) mostly

implied business models generated by the crowd. Only two business models of the experts versus 13 business models of the crowd were regarded as new by the judges. In sum, it turned out that significantly more business models generated by the crowd can be assigned to the group of top ideas than one would expect when looking at the overall number of generated business models ($p < .01$). Regarding the relevance of the generated business models, we found that 21 (47%) business models scored values higher than three. Similar to the business models' novelty, only three business models that were generated by the experts were considered as being of high market relevance. As in the case of novelty, more business models generated by the crowd than expected can be placed in the group of top business models in terms of market relevance ($p < .01$). Further, we found that 18 (34%) of the 38 business models possess a very high degree of elaboration. With regard to this category, five business models were generated by the experts. In line with the mean findings reported above, we do not find a significant difference in observed and expected frequencies for professional versus crowd business models in this quality dimension ($p > .10$). Finally, we analyzed the top business models in terms of the three-way interaction score (novelty x relevance x elaboration). We found that only two professional business models qualify as top business model in all three dimensions. In contrast to that, 9 (23%) of the business models generated by the crowd were regarded as top business models.

Insert Table 4 around here

Discussion

Due to the success of crowdsourcing initiatives in the field of new product development (Di Gangi and Wasko, 2009, Di Gangi et al., 2010, Afuah and Tucci, 2012), literature and practice began to extend the principle of crowdsourcing for innovation to the field of business model innovation (Rohrbeck et al., 2013, Chiou, 2011). One of the key questions discussed by academics and practitioners in this context is whether users are capable of generating new business models or are not able to express the solution information required for generating new business models (Rohrbeck et al., 2013). In this paper, we joined this debate by addressing the following research question: How attractive are new business models generated by a crowd of customers compared to new business models generated by a firm's professionals? In this paper, we presented a real-world comparison of the quality of business models generated by a firm's professionals compared to business models submitted by a crowd of customers via an online business model development tool. Overall, 97 customers participated in this business model development contest and developed 23 business models via the virtual community. In parallel, five company professionals generated 15 different business models in the course of a one-day workshop session. The developed business models were then forwarded to a jury of experts in the field of business model development. These experts evaluated the business models in regard to their quality. Our results clearly highlight the benefits of integrating a crowd of customers into a company's business model development process. In the following section, we will discuss the results in more detail and elaborate on their implication for theory. In conclusion, this study provides an important indication for research in the field of crowdsourcing for innovation; not only that

crowdsourcing initiatives among customers of a firm can actually help to innovate business models, but also that the proposed BMDT, which enables crowd integration into innovation via the Internet, is a promising way for realizing collaborative business modeling.

Contributions to theory

When looking at the results of this study, we consider this study contributing to three streams of literature. First, our results complement existing literature on customer integration and open innovation. The results of the expert evaluation indicate that a crowd of customers is capable of generating new business models that are significantly more novel than business models generated by experts. While this has also been confirmed by existing literature (Sethi et al., 2001, Kristensson et al., 2004, Madjar and Ortiz-Walters, 2008), our study complements this body of literature by delivering additional insights generated in the course of a real-world study. The same is true for the relevance of the developed business models. As outlined in the course of our literature review on customer integration, one would expect customers to generate new business models that are of high market potential. This is because customers often do have deep insights into the needs of their peers and are therefore capable of developing new solutions that address these needs appropriately. However, the evaluation of the relevance criteria also implied the evaluation of the financial potential of the developed business models. In most of the previous studies, the financial potential of new product or service concepts was implicitly assessed when evaluating the new concepts. This is because the new concepts were expressed in the form of ideas or product proposals. However, the business model canvas, which was used in this study, offered the customers the

possibility to explicitly address the financial streams that the concepts are expected to generate. On the other hand, the expert jury had the possibility to explicitly assess the financial potential of the developed concepts. In that, our study enhances existing literature by offering indications that customers of a company are able to anticipate potential financial streams and to explicitly express the resulting financial potential. When looking at the elaboration of the generated business models, the results of our study are ambiguous. Regarding this dimension, the customers were not able to generate new solutions that are significantly better than the solutions generated by the company's experts. Consequently, we had to reject our third hypothesis. One possible explanation for this might be found in the literature concerning absorptive capacity (Cohen and Levinthal, 1990) (i.e., a firms capability of understanding and absorbing knowledge that is located outside its own boundaries). According to existing literature in this field, the ability to absorb external knowledge is negatively correlated to the newness and complexity of the knowledge that has to be acquired (Lane et al., 2006). In addition to that, the absorptive capacity related to a certain kind of knowledge is also determined by the relationship of the partners involved in generating this knowledge (Lane et al., 2006). In this regard, the complementarity of the partners' existing knowledge base strongly influences a firm's ability to absorb external knowledge (Abecassis-Moedas and Mahmoud-Jouini, 2008). As a crowd of customers outside of the firm developed business models, which were relatively new to the firm, a low amount of absorptive capacity might constitute a possible explanation why the judges regarded the crowd-based business models as not being as feasible as the business models developed by the experts.

However, the degree of elaboration was rather high in both groups. In this regard, our study delivered at least some indications that customers are capable of generating solution information that is necessary to implement new product or service concepts. This becomes clearer when looking at the characteristics of new business models. The generation of new business models requires expressing causalities between its different building blocks (e.g., which activities are necessary for value creation; how can these activities be supported by partners; etc.). To the best of our knowledge, there is no study that found customers to successfully express such causalities. In that, our study enhances existing literature on open innovation by delivering first indications that a crowd of customers is capable of assessing causalities within new solution concepts. However, such solution information is of high importance for companies when trying to realize new product or service concepts. As the development of new business models requires the customers to explicitly express such information, business models might constitute a promising new instrument that can be used to extend customer integration beyond ideas competitions.

The second stream of research our study is contributing to is the field of so-called collaborative business modeling (CBM). As outlined in the course of the introduction, recent literature began to extend the principle of crowdsourcing for innovation to the field of business model innovation (Rohrbeck et al., 2013, Chiou, 2011). These CBM initiatives are characterized by the cooperation for business model innovation within networks of customers, suppliers, and other divisions of a firm. One of the key questions increasingly discussed by academics and practitioners, which are engaged in this stream of research, is whether users are capable of generating new business models or

are not able to express the solution information required for generating new business models (Rohrbeck et al., 2013). As indicated by the results of our empirical evaluation, customers are indeed capable of developing promising new business models. This conclusion is supported when looking at the three-way interaction term of the evaluation results. The business models generated by the crowd were significantly better in terms of the overall quality than the business models generated by the company's experts. In this regard, our study delivers first empirical insights that the integration of customers into a CBM initiative is a promising way to enrich a company's innovation process. By executing such CBM initiatives, companies might be able to reduce the danger of employing too costly and inappropriate ways to commercialize their new products or services because the business model construct explicitly addresses these value capture mechanisms (Amit and Zott, 2001).

Third, our study contributes to research in the field of IT-enabled business model development. The question whether IT tools can be used in order to facilitate collaborative business model development was not assessed in the past. Consequently, there is an ongoing call for research that sheds light on the effects of employing such business model development tools (BMDT) in the course of collaborative business modeling (Veit et al., 2013, Osterwalder and Pigneur, 2013). Our study contributes to this discussion by providing empirical insights that such BMDT can successfully be used in the course of a CBM initiative. In the course of this study, the integrated customers had to develop their business models via a virtual platform. This platform provided the customers with collaborative functions to elaborate on their business models. As the results of the expert's evaluation demonstrate, the business models developed in this virtual environment pos-

sessed a sufficient degree of quality. Thereby, the study delivered support for the assumption that BMDT can be considered as useful and valuable instruments for CBM. However, as this was the first time such a BMDT was tested, future research is needed that would further improve the efficiency of the BMDT resulting in an even higher degree of quality of the business models. For example, it would be profitable to analyze how to design inherent IT tools or an underlying organizational process, so that the BMDT would even more target and systematically support the collaborative activities of the crowd, so that the outcome quality of the crowd's CBM would rise in turn. In this regard, theoretical approaches from collaboration research might help for a targeted future development of the socio-technical BMDT.

Managerial implications

Managers of business development departments might lean on our findings. Our findings suggest that crowdsourcing the business model development might be as effective as crowdsourcing idea generation for new product development. By suggesting this, it is important to point out that the aim of this study was not to question the general importance of professionals in business model development. An optimal approach in practice might more often than not lie in a combination of both extremes (professionals collaborating with the crowd in some way). However, the findings of the study constitute an important contribution to justify the more active involvement of crowds in developing new business models.

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Appendix

Table 1. Use of Collaboration Functions in the Course of the Contest

# Business Model	# Members that Contributed	# Revisions	#Comments	# Shouts
1	5	19	0	13
2	5	36	2	13
3	6	12	1	0
4	6	5	0	0
5	6	19	0	6
6	5	15	1	4
7	6	16	0	0
8	3	11	0	2
9	5	6	10	1
10	5	22	0	10
11	6	6	1	2
12	6	23	0	4
13	5	15	0	9
14	6	6	0	1
15	4	6	0	0
16	6	13	4	2
17	6	27	0	24
18	5	46	1	10
19	4	15	0	1
20	6	35	0	3
21	4	12	2	0
22	5	6	8	2
23	6	15	0	0
Average	**5**	**17**	**1**	**5**

Table 2. Operationalization of Dimensions and Corresponding ICC Coefficients

Dimensions	Corresponding Item	ICC Coefficient (two-factorial, random)
Novelty	The business model is unique and uncommon	0.875
Relevance	The business model addresses an important customer need and has an attractive financial potential	0.877
Elaboration	The business model is described accurately and is well understandable	0.867

Table 3: Comparison of Novelty, Customer Benefit, and Feasibility between Expert and Crowd Business Models

Quality Dimension	Crowd (N=25)		Experts (N=13)		Mann-Whitney U Test Z-Value (p-Value)
	Mean	Standard Deviation	Mean	Standard Deviation	
Novelty	3.20	0.84	2.40	0.70	-2.81 (0.005)
Market Relevance	3.40	0.82	2.47	0.89	-3.01 (0.003)
Elaboration	3.19	1.05	2.80	0.79	-1.04 (0.299)
3-Way Interaction	29.39	7.52	23.00	5.89	-2.57 (0.009)

We use Mann-Whitney U tests instead of simple t-tests because the dependent variables are not normally distributed.

Table 4: Comparison of Top Business Models Generated in the Study

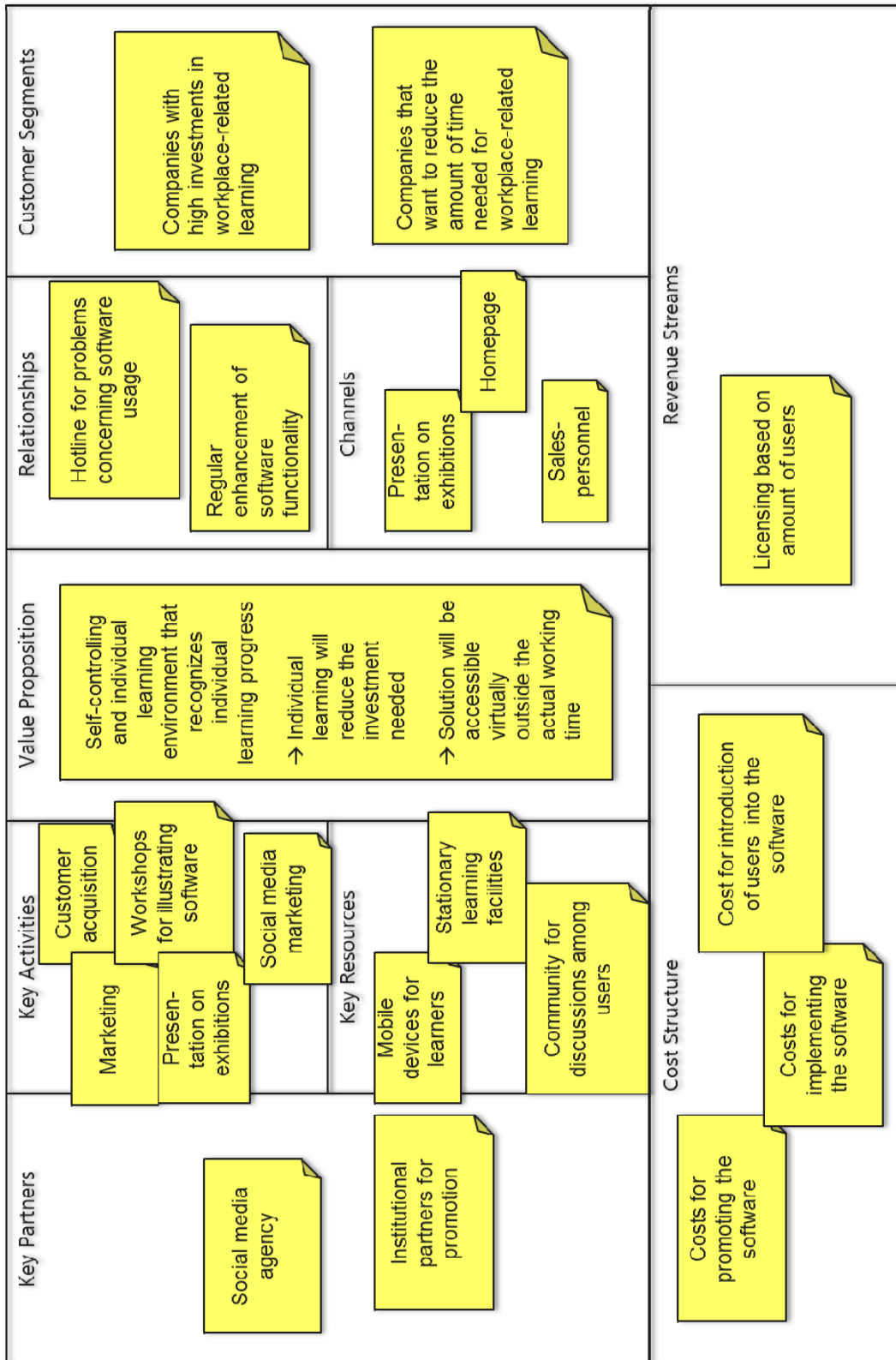|	Novelty		Relevance		Elaboration		3-Way Interaction	
	Crowd N=25	Experts N=13	Crowd N=25	Experts N=13	Crowd N=25	Experts N=13	Crowd N=25	Experts N=13
	Observed Frequency (Expected Frequency)							
Top Ideas*	13 (9.1)	2 (5.8)	18 (12.7)	3 (8.3)	13 (10.9)	5 (7.1)	9 (6.7)	2 (4.3)
Other Ideas	10 (13.9)	13 (9.1)	5 (10.3)	12 (6.7)	10 (12.1)	10 (7.9)	14 (16.3)	13 (10.7)
Chi-Square (p-Value)	7.088 (0.008)		12.465 (0.000)		1.958 (0.162)		2.938 (0.087)	
*Top business models are defined as those that score higher than three in the respective quality dimension								

Figure 1: Sample Business Model Developed by the Experts

Figure 2: Sample Business Model Developed by the Crowd

Key Partners
- Provider of VR-kit
- Institutions and associations for promoting the service

Key Activities
- Software development
- Training for own personnel
- Maintenance of kits
- Customer acquisition
- Refinement of software based on user feedback

Key Resources
- Experts for content production
- Departments nearby OEMs
- Software developer
- IT infrastructure

Value Proposition
- Virtual Reality Kit (goggles and gloves) for professional training in the automotive industry
  - → Combines theoretical and practical content in one environment
  - → Practicing in the virtual working place reduces chances for work-related accidents

Relationships
- Personal customer care for OEMs
- Regular updates with notification
- Service hotline

Channels
- Homepage
- Presentation on exhibitions
- Personnel acquisition through sales personnel

Customer Segments
- OEMs in the automotive sector that intend to improve professional training
- Garages that intend to train personell concerning a new product

Cost Structure
- Cost for establishing departments nearby OEMs
- Costs for selling the software
- Costs for developing the software

Revenue Streams
- Additional revenues through training for system usage
- Licensing based on amount of users as well as the equipment provided