The value of crowdsourcing:

Can users really compete with professionals in generating new product ideas?

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Working Paper

A later version of this paper is forthcoming in the *Journal of Product Innovation Management*.

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Authors' note: Both authors contributed equally. We would like to thank Felix Klobassa, Stefan Roehrig, and Herfried Schwarz for their valuable help in realizing this study, the Bamed / MAM group for their cooperation, and especially Peter Roehrig, Sabine Beer and Thomas Rohaczek for the time and effort they invested in this project. We also thank Lars Bo Jeppesen, Eric von Hippel and the participants in the DRUID conference for their comments and feedback on earlier versions of this article. Finally, we are grateful for the very helpful suggestions made by the editor, Tony di Benedetto, and the two reviewers.

Abstract: Generating ideas for new products used to be the exclusive domain of marketers, engineers, and/or designers. Users have only recently been recognized as an alternative source of new product ideas. Whereas some have attributed great potential to outsourcing idea generation to the "crowd" of users ("crowdsourcing"), others have clearly been more skeptical. The authors join this debate by presenting a real-world comparison of ideas actually generated by a firm's professionals with those generated by users in the course of an idea generation contest. Both professionals and users provided ideas to solve an effective and relevant problem in the consumer goods market for baby products. Executives from the underlying company evaluated all ideas (blind to their source) in terms of key quality dimensions, including novelty, customer benefit, and feasibility. The study reveals that the crowdsourcing process generated user ideas that score significantly higher in terms of novelty and customer benefit, and somewhat lower in terms of feasibility. However, the average values for feasibility – in sharp contrast to novelty and customer benefit – tended to be relatively high overall, meaning that feasibility did not constitute a narrow bottleneck in this study. Even more interestingly, it is found that user ideas are placed more frequently than expected among the very best in terms of novelty and customer benefit. These findings, which are quite counterintuitive from the perspective of classic new product development (NPD) literature, suggest that, at least under certain conditions, crowdsourcing might constitute a promising method to gather user ideas which can complement those of a firm's professionals at the idea generation stage in NPD.

Introduction

Consider the following experiment in idea generation: A company wishes to develop promising ideas for new products. Who would you suggest should be asked to generate ideas: the professional engineers, marketers and/or designers who work for the company, or its potential customers or users in general? Moreover, who would be able to come up with better ideas?

Despite its obvious importance to the ultimate success of a firm, the idea generation process is an area where scholars generally still have limited insights with regard to the "ideal" process. Schulze and Hoegl (2008, p. 1742), for example, note that "how new product ideas are effectively generated still remains an issue of high relevance to both management scholars and practitioners." Usually, however, it is a firm's marketers, engineers, and/or designers who take on the creative tasks in generating new product ideas. Based on extensive marketing research (or not) and using some theoretical approach to creativity in new product development (NPD) (e.g., Amabile et al. 2005, Goldenberg, Lehmann, and Mazursky 2001, Majchrzak, Cooper, and Neece 2004, Schulze and Hoegl 2008), those professionals try to identify (or create) and solve a relevant consumer problem by inventing a creative solution. The key assumption behind that intuitive approach is that a firm's professionals, unlike users, have the experience and expertise required to come up with truly novel and promising ideas which might be appealing to broader parts of the market and might therefore lead to successful new products (Ulrich and Eppinger 2008, Ulrich 2007). In a similar vein, Bennett and Cooper (1981, p. 54), for example, argued that a truly creative idea for a new product "is very often out of the scope of the normal experience of the consumer." Such opinions have been substantiated by the idea that users might be too accustomed to current consumption conditions (i.e., the present), thus preventing them from predicting and shaping the future (Leonard and Rayport 1997). Consequently, the logical conclusion from that classic line of

literature might be the following: “relying on the method of asking buyers to describe potential future products, big leaps to novel product ideas are generally not likely” (Schulze and Hoegl 2008, p. 1744). In the experiment described above, the answer would be that the company should ask its professionals to generate new product ideas.

On the other hand, however, there is a second, alternative line of literature which posits that it is at least plausible that some users might have reasonably good new product ideas (Jeppesen and Frederiksen 2006). This idea is supported by a growing body of studies which – contrary to conventional wisdom – show that users often innovate for themselves and that many of those user innovations are characterized by high commercial attractiveness (von Hippel 2005). Probably one of the most extreme and most frequently cited examples of user innovation is open source software (such as Apache or Linux), which is developed exclusively by a community of users rather than professional software developers employed by firms (Bagozzi and Dholakia 2006, Lakhani and von Hippel 2003, Lerner and Tirole 2002/2005, Pitt et al. 2006).[1] The great success of open source software – Apache, for example, is outperforming Microsoft in terms of market share in the web server security software market (see Netcraft.com) – has dramatically changed the potential role of users in corporate NPD efforts. In particular, a number of leading companies have already begun to experiment with the idea of harnessing the creative potential among users in order to fuel their own NPD pipelines.

Analogous to open source software, the underlying idea is to outsource the phase of idea generation to a potentially large and unknown population, referred to as the “crowd,“ in the

[1] It should be noted, however, that professional software developers have also recently made major contributions to improving open source software such as Apache or Linux on behalf of their employers (e.g., IBM). Because of the rapid diffusion of open source software, firms have an interest in improving it even further, for example in order to improve sales in complementary equipment (e.g., server hardware or websphere software).

form of an open call. Such initiatives have consequently become known as "crowdsourcing" (Agerfalk and Fitzgerald 2008, Howe 2006, Pisano and Verganti 2008, Surowiecki 2004). Although crowdsourcing can be positioned around many different populations, this study focuses on potential customers or users (for alternative populations, cf. Jeppesen and Lakhani 2009; for related approaches to open innovation or external sources of innovation through innovation tournaments, cf. Chesbrough 2003, Terwiesch and Ulrich 2009).

Dell, for example, has launched an initiative called Idea Storm where users from around the globe have been invited to suggest product improvements and new product ideas online. This initiative has resulted in more than 10,000 idea submissions (see Ideastorm.com). Another frequently cited example is the US fashion startup Threadless (Ogawa and Piller 2006, Fuchs and Schreier 2009), which specializes in hip T-shirts designed by users. Its highly active user community submits new design proposals on an ongoing basis, and every week the company chooses the most attractive user-designed T-shirts to be included in its product line. Similar initiatives have been reported for companies across various industries, including Adidas, BBC, BMW, Boeing, Ducati, and Muji (Berthon et al. 2007, Ogawa and Piller 2006, Piller and Walcher 2006, Sawhney and Prandelli 2000, Sawhney, Verona, and Prandelli 2005). Compared to an active company-initiated search for and subsequent collaboration with specific types of users with the most promising ideas (e.g., based on the lead user method; Hienerth, Poetz and von Hippel 2007, Lilien et al. 2002, von Hippel 1986), crowdsourcing relies on a self-selection process among users willing and able to respond to widely broadcast idea generation competitions (Lakhani et al. 2007, Piller and Walcher 2006).

One of the key questions increasingly discussed by academics and practitioners is whether crowdsourcing initiatives can activate users who are actually willing and able to come up with new product ideas that might be appealing not only to the individual user but also to broader parts of the market. The authors join this debate by bridging the two streams of

literature described above and by addressing the following research question empirically: How attractive are new product ideas generated by users through a crowdsourcing process *compared* to new product ideas generated by a firm's professionals? This attempt is novel, since it offers the first real-world empirical comparison of ideas actually generated by a firm's professionals with those generated by self-selected users in an idea generation contest. Both professionals and users created ideas for a given, effective and relevant problem faced by a consumer goods company. Addressing this research question is important, since in the long run it will guide a firm's decision whether or not to launch crowdsourcing initiatives (such as idea generation contests) for specific problem areas in which the firm wishes to innovate.

Background: Why users might (not) be able to compete with professionals

In general, there is a growing body of literature that highlights the benefits of considering user input for NPD activities. Terwiesch and Ulrich (2009), for example, note that across industries, about a quarter of innovation opportunities tend to come from interactions with customers and new customer requirements. More specifically, user input for idea generation might come in two forms: First, a certain type of market research might reveal important user needs which are not yet met by commercially available products. This *needs*-based information (i.e., what is the problem?) might then serve as a promising starting point for a firm's professionals to guide their idea generation efforts (i.e., how can we solve the problem?). The bulk of classic NPD literature would clearly see this approach as beneficial (e.g., Cooper 2001, Crawford and di Benedetto 2006, Ulrich and Eppinger 2008, Urban and Hauser 1993). Ulrich and Eppinger (2008, p. 54), for example, note that firms "must interact with customers and experience the use environment of the product. Without this direct experience, (…) innovative solutions to customer needs may never be discovered." In a similar vein, literature on integrating the "voice of the customer" (e.g., Dahan and Hauser

2002, Griffin and Hauser 1993) or Quality Function Deployment (e.g. Hauser and Clausing 1988) emphasizes the importance of asking users to describe the benefits to be delivered by a new product in their own words, as "engineers require greater detail on customer needs than is provided by the typical marketing study" (Griffin and Hauser 1993, p. 2).

The second and more controversial type of user input might relate to *solution*-based information – not only asking users about their problems, but also about potential ways to solve them (von Hippel 2005). The idea generation experiment mentioned above can be specified in more detail: A company operating in the baby products market, for example, aims to generate new product ideas, and market research has already revealed a major consumer problem, that is, consumers would greatly benefit from new solutions to improve the feeding of babies. Who would be able to come up with better ideas: the firm's professionals or the users of its products? Given that the relevant consumer problem has already been identified through some type of user involvement, the answer would most likely be even more clearly in favor of the firm's professionals. It can even be argued that if users provide both needs-based and solution-based information, firms should disentangle the two and mainly focus on the former. Ulrich and Eppinger (2008, p. 62), for example, note that "customers often express their preferences by describing a solution concept or an implementation approach; however, the need statement should be expressed in terms independent of a particular technological solution." Thus, users could help in defining *what* a potential new product should do, but they might be less valuable in defining *how* it should work. The latter task should be handled by a firm's professionals, who are assumed to "have acquired skills and capabilities that allow them to perform most design tasks more effectively and at a higher level of quality" (Ulrich 2007, Chapter 3, 5ff).

Furthermore, Amabile (1998) points out that besides creative thinking skills and motivation, the expertise of R&D and marketing personnel in terms of technical, procedural and

intellectual knowledge is a central driver for generating novel and useful ideas. Ulrich and Eppinger (2008) and Ulrich (2007) also argue that there is no way to circumvent the need for a certain level of design knowledge with respect to how existing solutions work and how they can be modified in the development of new products. By increasing their level of expertise, engineers develop a better understanding of the product components and thus invent with greater reliability because they can avoid elements that failed in the past (Vincenti 1990). More generally, the more competence and experience inventors possess, the higher the expected quality of their solutions will be (e.g., Larkin et al. 1980, Weisberg 1993, Magee 2005).

Many companies therefore used to rely exclusively on their internal expertise and knowledge bases when generating ideas for new products. This "local search behavior" in NPD still tends to be the predominant approach in practice (e.g., Nelson and Winter 1982, Stuart and Podolny 1996). This makes sense as firms can more easily manage and maintain their innovation rents (e.g. managing intellectual property rights by building on existing patents and filing for new ones), competitive advantage (being fast on the market), and strategic fit (complementing existing products in a meaningful way). Nevertheless, there is also a downside to local searches by a firm's professionals: Firms that rely too heavily on their internal expertise might be blocked from finding alternative, potentially more successful solutions (Helfat 1994, Stuart und Podolny 1996, March 1991, Martin und Mitchell 1998, von Hippel 1994). Katila and Ahuja (2002), for example, analyze the effects of exploiting company-internal expertise versus exploring external knowledge on new product performance in the global robotics industry. They find that using and re-using existing internal knowledge indeed fosters the generation of new products, but the relation is curvilinear, indicating that beyond a certain point the additional exploitation of internal expertise will lead to a drop in new product output. Contrary to their expectations, Katila and

Ahuja (2002) also find that the extent to which a firm explores external knowledge is *positively* related to successful new product innovation.

Based on the limits of the classic idea generation process driven exclusively by a firm's professionals, a second line of literature has started to challenge the commonly held assumption that users are of little value for generating new product ideas. A number of empirical studies on the sources of innovation in the fields of industrial as well as consumer goods have revealed that users rather than manufacturers were often the initial developers of products which later gained commercial significance (for an overview, see von Hippel 2005). Baldwin, Hienerth and von Hippel (2006) even argue that user innovators can, under certain conditions, serve as the starting point for industry development by bridging periods of uncertainty in early phases of industry life cycles because of different cost/benefit structures. Moreover, empirical studies have demonstrated that user innovation is not a rare occurrence: Up to 30% of the user populations surveyed to date reported that they had already developed new or modified products themselves, and those products are often characterized by high levels of commercial attractiveness (Franke and Shah 2003, Franke, von Hippel, and Schreier 2006, Morrison, Roberts, and von Hippel 2000).

Although this line of research has presented strong arguments that users might also possess sufficient expertise to come up with commercially attractive new product ideas, there are hardly any studies available that attempt to make a direct comparison between a firm's professionals and users. A few inferences can be made, however, based on studies related to the lead user method. Lilien et al. (2002), for example, find that new product concepts *jointly* developed by carefully selected lead users collaborating with in-house personnel at 3M were characterized by higher innovativeness and showed a sales potential which was an average of eight times higher than traditionally developed 3M concepts. Similarly, Urban and von

Hippel (1988) find that a new personal computer CAD system that included lead user innovations was significantly preferred over the best commercially available system.

In an effort more closely related to our research question, Kristensson, Gustafsson and Archer (2004) set out to contrast ideas generated by professionals with those generated by users in the field of mobile phone services (see also Magnusson, Matthing, and Kristensson 2003, Magnusson 2009). Although their laboratory environment limits the external validity (e.g., the users were students; the professionals did not face real-world incentives), they offer some interesting insights. Regarding the idea generation process, for example, they find that "professional developers elaborated with informational elements that were not as cognitively remote," whereas users seemed to have "access to informational elements that were further apart" (Kristensson, Gustafsson and Archer 2004, p. 11). As presented by those authors, the reason for this might again be the fact that prior knowledge and experience concerning what has technically worked (or not) in the past blocked the divergent thinking skills necessary for developing truly novel solutions. As users were not hampered by concerns regarding how current technologies operate, they were able to come up with mobile phone services that were more original. In contrast, professional developers seemed to focus more on how a potential idea could be translated into an actual mobile phone service for the market (thus stressing the feasibility of the ideas). Kristensson, Gustafsson and Archer (2004) thus argue that professionals are more driven by a convergent thinking style which results in less novel ideas.

Finally, and directly related to the research question addressed in this study, Ogawa and Piller (2006) were among the first to provide anecdotal, real-world evidence indicating that user ideas generated in the course of a crowdsourcing process might also hold commercial potential. They report that at Muji, a Japanese manufacturer of consumer goods, some new products have been developed on the basis of ideas submitted by users (e.g., a beanbag sofa, a portable lamp and an innovative bookshelf). They also indicate that some of those products

outperform traditionally developed products in terms of sales – despite the fact that Muji has become famous for its internal design capabilities.

Going back to the experiment in idea generation and to the research question set out in the introduction (i.e., how attractive are new product ideas generated by users through a crowdsourcing process *compared* to new product ideas generated by a firm's professionals), the existing literature remains inconclusive. Overall, the first line of research would probably reject – whereas the second line would tend to support – the idea that some new product ideas generated by users might seriously compete with new product ideas generated by company professionals. Thus, a real-world study exploring the topic in more detail certainly appears to be a promising next step.

Study method

Overview. In order to address the research question outlined above, a firm that met the following criteria was identified for collaboration: 1) It had to have the need and intention to innovate in a certain product area; 2) by default, it had to use its internal professionals to generate new product ideas; and 3) it had to be willing to launch a simultaneous idea generation contest in order to collect user ideas. Finally, the company had to be willing and able to evaluate all ideas regardless of their source (professionals vs. users) along all key dimensions in order to fully assess the quality of available ideas.

The Bamed / MAM Group (www.mambaby.com), a leading company in the baby products market, was identified as a firm which fulfilled our criteria and was willing to collaborate in this project. The Bamed / MAM Group is based in Austria and has eight sister companies located in Germany, the UK, Sweden, Hungary, Spain, Brazil, Thailand and the US. The group employs 400 people worldwide, and its products are sold in over 30 countries on all five continents, with more than 40 million baby products sold each year. Bamed / MAM is

the market leader in many countries, and it is positioned as a firm which is highly capable of designing leading-edge baby products (as demonstrated by several international design prizes).

Traditionally, the Bamed / MAM Group has applied a typical stage-gate model in their NPD projects (e.g., Cooper 1990). Using various market research techniques, they attempt to identify unmet consumer needs or related consumer problems, which marketers, R&D professionals, and designers then try to address by generating new product ideas. Only the best ideas make it to later stages, where the group might also cooperate with internationally renowned scientists, health experts, midwives and child development educators in order to arrive at the final products to be introduced on the market. The Bamed / MAM Group currently holds 63 patents for technology and designs.

Idea generation. This study relates to an innovation project within the company's feeding product line. Market research conducted by the company within that field has shown that consumers experience a strong need for solutions that make the additive feeding of babies with mash and solid food more convenient for both parents and babies. Based on this market need, the Bamed / MAM Group started their regular internal idea generation process and – in parallel – launched an idea generation contest to collect ideas created by users.

Company-internal idea generation (i.e., ideas generated by professionals) led to a total of 51 ideas that were ready to be presented to upper management. The users, in contrast, were invited to submit their new product ideas via the company's website, where the idea generation contest was announced. In addition, a link to the competition website was posted in several internet forums and advertised in a number of newsletters. The website contained an introductory text explaining the contest, a description of the underlying problem for which ideas should be generated, and an online form with which users could submit ideas. After submitting their ideas, users were also asked to complete a short questionnaire in order to

provide insights on the sample characteristics. The incentives for participation were a cash prize of €500 for the winning idea and 50 non-cash prizes (i.e., personalized pacifier boxes with a retail price of approximately €16 each) to be raffled off among participants. Overall, 70 users participated in this idea generation contest (i.e., submitted an idea via the website and completed the questionnaire).

Evaluation of ideas. The quality of the ideas was assessed by two executives from the company (the CEO and the head of R&D) who are also generally among the persons responsible for deciding which ideas should finally pass the gate to the next NPD stage. Both experts have extensive market and technical knowledge. They were blind to the source of the ideas (professionals vs. users). Similar ideas – regardless of their source – were grouped by the researchers prior to the start of the evaluation process in order to facilitate better comparisons. The groups of ideas as well as the ideas within each group were presented to the experts for evaluation in random order, with each idea described on a separate sheet.

As a first step, the experts were asked to look at all of the ideas and to assess 1) whether the submissions constitute true ideas (and not just comments on the topic, such as "teach your babies how to eat") and 2) whether the ideas could be evaluated properly (i.e., they were described in a way that allows serious evaluation). Overall, 18 user submissions (and none of the professional ideas) were excluded from further analysis on the basis of those two criteria.

The remaining 52 user ideas all contained both needs- and solution-based information related to making the additional feeding of babies more convenient. More specifically, 16 ideas (31%) were already in use (i.e., users had created prototype solutions) and 36 ideas (69%) described solutions with "concept" status. This suggests that the participating users had been facing the underlying problem for quite some time (and that they did not tend to create ideas ad hoc). The self-selection process in this crowdsourcing strategy thus seems to have worked effectively. Before the experts assessed the final quality of ideas in more detail, they were

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 had the opportunity to discuss differences in their assessments and change their individual ratings based on their joint discussion if desired.

Following previous research (e.g., Amabile et al. 2005, Franke, von Hippel, and Schreier 2006, Kristensson, Gustafsson, and Archer 2004, Moreau and Dahl 2005) the quality of the ideas was measured using three key variables: 1) the *novelty* of the idea compared to existing target market products, 2) the value of the idea in terms of its ability to solve the underlying problem (in our case making the additional feeding of babies with mash and solid food more convenient for both parents and babies) and thus to create *customer benefit*, and 3) the *feasibility* of an idea in terms of how easy it could be translated into a commercial product (the evaluators considered both technical and economic aspects when assessing an idea's feasibility). Despite being slightly more detailed, these evaluation procedures realistically reproduce the decision-making process usually applied by this company at this NPD stage. All three variables were measured using five-point rating scales (where 1 = low novelty/customer benefit/feasibility and 5 = high novelty/customer benefit/feasibility).

Interrater reliability was assessed by calculating Krippendorff's alpha for each quality dimension. Krippendorff's alpha is a conservative index that measures agreement among multiple raters and is considered to be a highly rigorous measure for assessing interrater reliability for rating scales such as those employed in this study (values of .67 and greater are generally considered to be satisfactory; Krippendorff 2004). The agreement coefficients for novelty, customer benefit, and feasibility are .65, .61, and .81, respectively. Given the difficulty of the specific task (predicting the attractiveness of potential new products based on ideas), those results seem to be satisfactory (Amabile et al. 1996, Franke, von Hippel, and Schreier 2006, Krippendorff 2004, Kristensson, Gustafsson, and Archer 2004). For further

analysis, the two experts' scores for each of the three dimensions were averaged. In addition, a three-way interaction term (novelty x customer benefit x feasibility) was created in order to allow a comparison of the overall quality of ideas between the two samples. However, in line with previous research (e.g., Kristenssen, Gustafsson, and Archer 2004, Urban et al. 1997), it is noted that novelty is positively correlated with customer benefit (r = .36) but negatively correlated with feasibility (-.36). In addition, customer benefit is also negatively related with feasibility (-.24; all p's < .01). This implies that the well-known trade-off between maximizing output (pursuing very promising ideas in terms of high novelty and high customer benefit) and minimizing input (pursuing ideas that are the easiest to realize in terms of costs and effort) is also a factor in this study.

From a theoretical and practical perspective, comparing mean differences between professional and user-generated ideas in terms of novelty, customer benefit, and feasibility (and the interaction of those dimensions) is only one way to look at the data. Another approach which may be even more relevant is to compare the very best ideas to all of the other ideas in terms of the three quality dimensions. In other words, it would be especially important to know who came up with the *very best* ideas, since it is those few ideas which a company might wish to identify (e.g., in order to determine the number of ideas to be moved to concept development and testing phases, and more broadly in order to maximize a firm's expected profits from NPD; Dahan and Mendelson 2001). For example, what if the variance (but not the means) of professional and user ideas was very different (e.g., included a few very attractive professional ideas and many which are around or below average, versus many average user ideas but hardly any excellent ideas)? In such a situation, looking at means versus the "best versus the rest" would naturally raise fairly different practical and theoretical implications (Fleming 2007). Thus, three dummy variables were created where ideas assigned a value greater than three (or less than or equal to three) in each dimension are

defined as top (or other) ideas (for a similar approach, see Magnusson, Matthing, and Kristenssen 2003, Magnusson 2009).

Description of the user sample. What are the main characteristics of the participants in the underlying idea generation contest? Consistent with the domain of baby products, participating users were predominantly female (90.4 percent) and on average 31.46 years old (SD = 6.54). Next, several user characteristics that have been identified as positively related to user innovativeness were captured (Franke and Shah 2003, Franke, von Hippel, and Schreier 2006, Jeppesen and Frederiksen 2006, Lüthje 2004, Lüthje, Herstatt, and von Hippel 2005, Schreier and Prügl 2008). All items (adapted from those sources) are measured on five-point scales (where 1 = strongly disagree and 5 = strongly agree). First, it is found that participants tend to have experience with the underlying problem, that is, feeding babies (mean = 3.85; SD = 1.26; measured by the single item "I have a lot of experience in the additional feeding of babies with mash and solid food"). Second, participants report having a sound technical knowledge of the related products (mean = 3.34; SD = 1.17; measured by the two items "I am particularly interested in the technical aspects of feeding products" and "With regard to feeding products, I consider myself a 'tinkerer'"; Cronbach's alpha = .66). Third, there is some agreement regarding the two lead user characteristics of high expected benefits from innovations (mean = 3.54; SD = 1.02) and being ahead of a trend (mean = 2.89; SD = 1.01). High expected benefit is measured using the three items "I have already had problems in feeding babies which could not be solved by commercially available products," "In my opinion, there are many unresolved problems with products for the additional feeding of babies with mash and solid food" and "I have baby-feeding needs that cannot be satisfied by existing products"; alpha = .73; being ahead of a trend is measured using the four items "In general, I find new solutions or products for feeding babies earlier than others", "In the past, I have benefited highly from adopting new feeding products", "With regard to buying

and using new feeding products, I am often asked for advice", and "I have already tried to modify existing products in order to improve the process of feeding babies"; alpha = .78. Finally, participants generally tend to regard themselves as creative personalities (mean = 3.62; SD = .84), as measured by a short form of the established Kirton Adaption Innovation Inventory (alpha = .93; for items, see Im, Bayus, and Mason 2003, Kirton 1976). It is noted that none of these measures are significantly correlated with the quality of the submitted ideas. While to some extent this might be attributed to the small size of the sample (n = 52), this can also be interpreted as an indication that an effective self-selection process was at work (Füller, Matzler, and Hoppe 2008, Jeppesen and Frederiksen 2006, Piller and Walcher 2006). It appears likely that only those users who have something to discuss regarding the underlying problem decided to participate in this idea generation contest. Yet the mean statistics reported above clearly suggest that not all participants were "true" lead users. This and related aspects are addressed in more detail in the general discussion.

Findings

First, the results indicate that ideas created by professionals score significantly lower in terms of novelty (mean = 2.12) than ideas created by users (mean = 2.60; $p = .05$). Second, it is also found that professional ideas are attributed significantly lower customer benefit (mean = 1.86) compared to user ideas (mean = 2.44; $p < .01$). Third, it appears that ideas created by professionals tend to be significantly easier to realize (mean = 4.33 vs. mean = 3.91; $p < .10$). However, the relatively high mean statistics indicate that feasibility does not constitute a bottleneck for the underlying ideas. Interestingly, professional ideas also score significantly lower (mean = 16.75) than user ideas (mean = 24.93; $p < .05$) on the overall quality index (the three-way interaction term novelty x customer benefit x feasibility; see Table 1). In addition, for all quality dimensions, the variances for professional and user ideas are not

equal (variances appear to be consistently lower for professional ideas). In conjunction with the relatively low mean values for novelty and customer benefit, this supports the study's conjecture that it might not be sufficient to look at mean differences alone.

Insert Table 1 about here

Therefore, the next step is to turn to the "best versus the rest" of the ideas (see Table 2). As noted above, top ideas are defined as those which score *higher than three* on the five-point scale in each of the three quality dimensions. First, the results indicate that 24 of the 103 total ideas are considered very new (top ideas in terms of novelty). More interestingly, this relatively small percentage (23%) mostly comprises user ideas, as only six professional ideas (compared to 16 user ideas) belong to this group. Thus, significantly more user ideas (and fewer professional ideas) than expected can be assigned to the group of top ideas in terms of novelty ($p < .05$). Second, it appears that only 12 of the 103 ideas qualify as top ideas in terms of customer benefit (12%). As in the case of novelty, only two professional ideas (compared to eight user ideas) belong to this group. Again, this pattern is statistically significant: More user ideas (and fewer professional ideas) than expected can be placed in the group of top ideas in terms of customer benefit ($p < .05$). Third, it is found that 79 of the 103 ideas are considered easy to realize (top ideas in terms of feasibility). This very large share (77%) comprises 42 professional ideas and 37 user ideas. In contrast to the mean findings reported above, however, there is no significant difference in observed and expected frequencies for professional versus user ideas in this quality dimension ($p > .10$).

Insert Table 2 about here

From a company's perspective, it might be also interesting to see whether some ideas which are among the top ideas in one dimension are rated similarly in the other dimensions (because ideas that are very novel, deliver high customer benefit and are easy to realize at the same time clearly constitute the most promising opportunities). In a final step, therefore, those

interactions are explored on a descriptive basis. Due to the small observed frequencies (mostly ≤ 3), however, significance tests are not reported.

Overall, the results indicate that user ideas are at least on par with professional ideas in this analysis (see Table 3). In particular, only one professional idea and three user ideas qualify as top ideas in *all three* dimensions. Second, only three professional ideas (vs. 13 user ideas) belong to the group of top ideas at least in two dimensions. For example, only one professional idea which received a top rating in terms of novelty is also found to be very easy to realize (top feasibility). In contrast, eight user ideas that belong to the top group in terms of novelty also qualify for the top feasibility group. In terms of customer benefit x feasibility, the findings are tied: One professional idea and one user idea are attributed high customer benefit and high feasibility at the same time. Finally, none of the professional ideas (compared to one user idea) are placed at the top in terms of novelty as well as customer benefit.

Insert Table 3 about here

Discussion

Summary and implications. Who can generate better ideas for new products: the professional engineers, marketers and/or designers who work for given company, or potential customers or users who respond to a crowdsourcing process? Classic NPD literature would consider this a somewhat odd question or experiment, since it is widely assumed that users might *only* be useful in identifying important unmet needs (i.e., what is the problem?) but *not* in identifying promising ideas to solve them; after all, this used to be the exclusive domain of a company's professionals. Nonetheless, this issue was defined as the research question underlying this study because there is an alternative line of literature which suggests that users can, in fact, provide valuable needs-based as well as solution-based information in the idea generation

stage of the NPD process. The relevance of this question is high, as many leading companies have already begun to experiment with crowdsourcing initiatives in order to fuel their own NPD pipelines.

This research question was approached by conducting a real-world comparison of the quality of ideas actually generated by a firm's professionals compared to those submitted by self-selected users in the course of an idea generation contest. Both users and professionals created ideas for an effective and relevant problem in the consumer goods market for baby products. The findings of the study show that user ideas clearly score higher on average in terms of novelty and customer benefit, and somewhat lower in terms of feasibility, indicating that professionals are more capable of coming up with ideas that can be developed more easily into a product for the market. However, the average values for feasibility – in sharp contrast to novelty and customer benefit – tended to be relatively high. As a result, this dimension did not constitute a narrow bottleneck in this study (i.e., given that they were assessed as promising in terms of novelty and customer benefit, most ideas would have had a fair chance of being developed for the market with a reasonable level of effort). Even more interestingly, the study revealed that the best ideas overall tended to be more heavily concentrated among users compared to a firm's professionals.

These findings, which are quite counterintuitive from the perspective of classic NPD literature, suggest that crowdsourcing among users might complement the work of a firm's professionals in the idea generation stage of NPD. Here it is important to point out that the aim of this study was not to question the *general* importance of professionals in idea generation. It is also believed that an "optimal" approach in practice might more often than not lie in a combination of both extremes (professionals collaborating with users in some way). However, the findings of the study constitute an important contribution to *justify* the more active involvement of users in idea generation.

Generalizability and future research. The findings are based on only one case study. Thus, future research is encouraged to conduct similar tests in different settings in order to gain a deeper understanding of the merits of involving users in idea generation. Of course, it is not expected that users will be able to compete with professionals in any situation. However, this case study suggests that users might truly constitute a promising complementary means of idea generation and that it might be valuable to study relevant contingency factors in future research. The authors conclude by discussing some of these factors, including user capabilities and motivation as well as the design of the crowdsourcing process itself.

First, the *ability* of users to come up with promising ideas for new products might depend most heavily on the underlying industry or the respective product category, as well as the nature of the specific problem for which the firm wishes to innovate. If the knowledge necessary to generate new product ideas in a given industry/product category is complex and/or difficult and costly to acquire – thus constituting a high entry barrier – users might be less likely to engage and/or succeed in developing their own ideas. If knowledge-based entry barriers are low and/or the knowledge needed to come up with successful ideas is closely linked to aspects of use experience – as in our case of feeding babies – users might be more successful (Baldwin, Hienerth, and von Hippel 2006, Lettl, Herstatt, and Gemünden 2006, Lüthje, Herstatt, and von Hippel 2005). Industries do vary in terms of the amount of knowledge necessary to understand how existing products work and how they can be modified. As a certain minimum knowledge of existing solutions tends to be a prerequisite for coming up with new ideas, the ability of users to generate successful ideas might also depend on the minimum level of knowledge necessary to understand how existing products function and can be modified in a given industry. As a result, there may be a significant relationship between knowledge-based entry barriers and the users' ability and likelihood of coming up with promising new product ideas. Future research might therefore analyze

different industries/product categories, which systematically vary in terms of the complexity of relevant knowledge.

As for the type of problem for which a firm wishes to innovate, the results imply that users might generally be better at solving needs-based problems (e.g., novel functionality) and worse at technology-based problems (i.e., dimensions of merit). This is because users have direct access to information on unmet needs and may thus be better equipped to come up with promising ideas for new products with novel functional capabilities (e.g., the first scientific instrument of a new type designed to address an unmet need). In contrast, companies might be more able to come up with promising "dimensions of merit" innovations (e.g., performance enhancements in an existing type of scientific instrument designed to improve the satisfaction of a given need) because they are more familiar with the underlying technology (Riggs and von Hippel 1994, von Hippel 2005). The ability of users to come up with promising ideas might not only depend on the type of problem itself, but also on the way it is communicated. Jeppesen and Lakhani (2009), for example, find that a firm's experience in articulating problems influences whether or not the problem is solved successfully by a group of external problem-solvers. Future research on how different problem types and their articulation influence the types of participating users and the quality of their ideas could therefore be useful in generating practical principles for designing crowdsourcing processes.

Second, the users' *motivation* might be closely tied to their willingness to invest in generating new product ideas and/or to share them with firms. Although it has been found that users tend to share ideas freely with their peers in communities (Harhoff, Henkel, and von Hippel 2003, Franke and Shah 2003), the conditions under which they might be willing to share with firms are unclear. Up to now, only anecdotal evidence has been found to suggest that certain users do share their ideas with certain firms – mostly because of firm recognition as a motivational factor (Jeppesen and Frederiksen 2006; for additional potential motives, cf. Füller, Jawecki,

and Mühlbacher 2007). Thus, it might be interesting to analyze how a crowdsourcing incentive system affects the outcome (cf. Franke and Klausberger 2009). In addition, it might be valuable to investigate which type of user is most likely to be willing to reveal ideas to firms, and whether such behavior depends on certain characteristics of the underlying industry and/or the underlying firm (Füller, Matzler, and Hoppe 2008).

Third, in this study many of the top ideas came from users, and the average quality of user-generated ideas was fairly high overall, indicating that the crowdsourcing process attracted qualified users. However, if it is not possible to attract qualified users, many of the ideas collected might not be valuable at all (Piller and Walcher 2006). On the other hand, the description of the sample in this study suggests that not all participants were what we would call lead users. Thus, the results might have been even better if the study had succeeded in attracting the most leading-edge users, who generally tend to constitute a minority of the overall user population. In any case, attracting the right people seems to be crucial to the success of any crowdsourcing efforts, as it not only affects the average quality of ideas submitted but also the average quality of the best ideas. Moreover, identifying the top ideas among all ideas submitted might constitute another important success factor. As in the case of Dell or Lego, for example, firms might simply be confronted with "too many" ideas from their user community and face the problem of not being able to filter and select the most promising ones (or only being able to do so with tremendous effort; for ideas on how to have the users themselves solve this problem, cf. Dahan, Soukhoroukova, and Spann 2009, Toubia and Florès 2007). In sum, it can be argued that factors related to user capabilities and motivation as well as the design of the crowdsourcing process might moderate the outcome (and thus determine when and why the findings of this study could be replicated).

Finally, it might be also valuable to study the potential pitfalls of relying too heavily on users. For example, how are proprietary firm knowledge, intellectual property rights, firm strategy,

and competitive advantage affected? A case study on 3M (Lilien et al. 2002) revealed that user- vs. firm-driven innovations did not create greater difficulties with regard to intellectual property protection and that there were no differences in the innovations' fit with existing manufacturing capabilities, distribution channels, and strategies. However, more research on this topic appears necessary in order to gain a better understanding of the potential trade-offs involved.

In conclusion, this study provides an important initial indication that crowdsourcing initiatives among users can actually outperform professional in-house activities for the generation of new product ideas, at least under certain conditions. The underlying company, for its part, was surprised and very enthusiastic about this outcome. They finally selected several of the best user ideas to pass the gate to the next NPD stage, in which professional designers and engineers might transform them into workable prototypes, and they also began to consider future initiatives to involve users in joint efforts with professionals to generate new product ideas.

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Table 1

Average novelty, customer benefit, and feasibility of professional versus user ideas

	Professional ideas (n = 51)		User ideas (n = 52)		
Idea quality	Mean	(SD)	Mean	(SD)	Mann-Whitney-U test Z-value (p-value)*
Novelty	2.12	(1.14)	2.60	(1.27)	-1.956 (.050)
Customer benefit	1.86	(.66)	2.44	(1.01)	-3.010 (.003)
Feasibility	4.33	(.91)	3.91	(1.21)	-1.856 (.063)
3-way interaction	16.75	(12.15)	24.93	(19.24)	-1.973 (.048)

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

Table 2

"Best versus the rest" ideas in terms of novelty, customer benefit and feasibility

	Novelty		Customer benefit		Feasibility	
	Company (n = 51) Observed frequency (Expected frequency)	Users (n = 52) Obs. (Exp.)	Company (n = 51) Obs. (Exp.)	Users (n = 52) Obs. (Exp.)	Company (n = 51) Obs. (Exp.)	Users (n = 52) Obs. (Exp.)
Top ideas*	6 (10.9)	16 (11.1)	2 (5.0)	8 (5.0)	42 (39.1)	37 (39.9)
Other ideas	45 (40.1)	36 (40.9)	49 (46.0)	44 (47.0)	9 (11.9)	15 (12.1)
Chi-square (p-value)	5.536 (.019)		3.859 (.049)		2.318 (.128)	

* Top ideas are defined as those which score *higher than three* in the respective quality dimension.

Table 3

Top ideas in interactions between novelty, customer benefit and feasibility

	Company		Users	
	Top feasibility ideas (n = 42) Observed frequency	Other ideas (n = 9) Obs.	Top feasibility ideas (n = 37) Obs.	Other Ideas (n = 15) Obs.
Top benefit ideas	*(n = 2)*		*(n = 8)*	
Top novelty ideas	1	-	3	1
Other ideas	1	-	1	3
Other ideas	*(n = 49)*		*(n = 44)*	
Top novelty ideas	1	4	8	4
Other ideas	39	5	25	7

Top ideas are defined as ideas with a score higher than three.

Top in all three dimensions

Top in two dimensions

Biographical sketches

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