Sourcing, Filtering, and Evaluating New Product Ideas: An Empirical Exploration of the Performance of Idea Markets

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Abstract

The proliferation of interconnectivity and interactivity through Internet-based technologies enables new forms of support for new product development. This article analyzes idea markets, which use widely distributed knowledge, the power of markets, and the Internet to support the crucial initial tasks of the new product development process, including the sourcing, filtering, and evaluation of new product ideas. Idea markets employ virtual stocks to represent new product ideas and allow participants to suggest and trade new product ideas in a virtual marketplace. This article empirically explores the performance of idea markets in a real-world field study at a large, high-tech B2B company that includes more than 500 participants from 17 countries and features various idea sourcing tasks. The results indicate that idea markets are a feasible and promising method to support the fuzzy front end of the new product development process. Idea markets offer a platform and formal process to capture, select, and distribute ideas in an organization, which motivates employees to communicate their ideas to management. By effectively sourcing and contemporaneously filtering, idea markets help reduce the number of ideas brought to management's attention to those that seem worthy of further consideration. Because idea markets also have the ability to source many ideas, they can increase efficiency at the fuzzy front end of the new product development process.

Keywords: Idea sourcing, idea filtering, idea evaluation, new product development, prediction markets, virtual stock markets, idea markets, innovation, fuzzy front end

Introduction

The persistent development of successful new products remains one of the most essential challenges for companies (Crawford and Di Benedetto, 2006), and the generation and the evaluation of new product ideas are important initial tasks in this critical new product development process. These two tasks represent the so-called “fuzzy front end” of new product development (Klink and Athaide, 2006; Montoya-Weiss and O'Driscoll, 2000; Reid and de Brentani, 2004) and have particular importance because they determine the company’s potential to identify promising new product ideas at reasonable costs (Goldenberg, Lehmann, and Mazursky, 2001; Kim and Wilemon 2002). Despite this importance though, Klink and Athaide (2006) emphasize that this aspect of new product development still demands the most improvement, a view recently shared by Barczak, Griffin, and Kahn (2009). Furthermore, the two tasks at the fuzzy front end appear even more complex for discontinuous or radical rather than for incremental innovations, because the former’s market success is particularly uncertain (Reid and de Brentani, 2004).

It seems obvious that companies should use the knowledge possessed by their employees during this fuzzy front end of new product development (e.g., Bhide, 1994), but few organizations do so (van Dijk and van den Ende, 2002). Employees may have promising ideas, but many of them lack the motivation or a channel to communicate them (Burt, 2004). Barczak, Griffin, and Kahn (2009) also assert that many companies lack a coherent or formal process for selecting ideas, which may mean that promising ideas just fade away. Finally, successful sourcing may generate so many ideas that the selection of the best ones becomes extraordinarily difficult or costly (Ozer, 2002; Toubia, 2006). Thus, a major challenge for new product

development at the fuzzy front end is to source, filter, and evaluate ideas from employees efficiently and comprehensively.

The proliferation of interconnectivity and interactivity through Internet-based technologies suggests some new methods that might support new product development (Dahan and Hauser, 2002), including open innovation initiatives (Chesbrough, 2003), innovation contests (Terwiesch and Xu, 2008), idea competitions (Piller and Walcher, 2006), and Internet-based innovation communities (Franke, Keinz, and Schreier, 2008), such as open source projects or open information communities (e.g., Wikipedia; von Hippel, 2005). A common characteristic of these new methods is their use of widely distributed knowledge through the interconnection of ideas from a vast number of participants (Toubia, 2006).

Idea markets build on this characteristic and draw on the efficiency of markets and the "wisdom of the crowd." That is, idea markets use virtual idea stocks to represent new product ideas in virtual marketplaces in which participants suggest and trade their shares of stocks, such that the resulting stock prices provide indicators of the likely success of the new product ideas. Prediction markets, which differ in scope but similarly use the efficiency of markets, repeatedly have provided excellent results in such varied areas as business, political, and sports forecasting (for a summary, see Spann and Skiera, 2003; see also Hahn and Tetlock, 2006).

This article proposes idea markets as a market-based method to source, filter, and evaluate new product ideas and technologies, as well as to explore their feasibility and performance. It tests an idea market with more than 500 participants from 17 countries in a real-world setting of a high-tech, business-to-business (B2B) company. The remainder of this article is organized as follows: The next section explains the motivation for the use of idea markets to source and evaluate new product ideas. Then follows a discussion of the theoretical foundations of idea markets and a description of the empirical study, which uses an idea market to source, filter and

evaluate new product ideas from employees at a B2B company. Finally, the article concludes with some managerial implications, limitations, and directions for further research.

Sourcing, Filtering, and Evaluating New Product Ideas

Previous research has investigated several methods to support the sourcing, filtering, and evaluation of new product ideas (for an excellent summary, see Crawford and Di Benedetto, 2006). The motivation for proposing idea markets as another method rests on the finding that they enable sourcing of multiple ideas from various idea contributors, enable interactive group decisions as filtering mechanisms, and combine the sourcing of ideas with their evaluation.

Sourcing New Product Ideas from Many Idea Contributors

The quality of new product ideas can be decisive for the commercial success of resulting products (Goldenberg, Lehmann, and Mazursky, 2001). However, it is demanding to determine the best idea contributors to include in the idea generation process, as well as the critical characteristics of good new product ideas a priori. This difficulty results from the rather stochastic nature of creativity (Carson, 2007; Hargadon and Sutton, 1997) and the uncertainty about new products' long-term success. Thus, many contributors with a diverse pool of skills can enhance the chances of finding an unconventional, perhaps even breakthrough new product idea (Joshi and Sharma, 2004).

Lead user theory provides some guidance about who may be a likely contributor of valuable new product ideas in the company's customer base (Franke, von Hippel, and Schreier, 2006). However, lead users still are difficult to identify in many markets; this identification mainly is possible in industries that sell knowledge- or skill-intensive products (Franke, von Hippel, and Schreier, 2006; Schreier and Prügl, 2008; von Hippel, 2005). A comparable theory

regarding the selection of promising idea contributors from among the company's own employees is missing.

Many ideas from varied contributors increases the chances of finding valuable ideas; as several studies show, the quantity of new product ideas correlates positively with quality (Diehl and Stroebe, 1987; Simonton, 1999). Furthermore, interactions among potential idea contributors, such as through exchanges of their opinions, increases the likelihood that contributors will submit an idea, because their exposure to other product ideas inspires and encourages them to suggest their own product ideas, which they might already have in mind or could result from focused exercises such as brainstorming (Diehl and Stroebe, 1987). These interactions also might trigger individual creativity and increase the quality of the submitted ideas (Garfield et al., 2001; Goldenberg, Mazursky, and Solomon, 1999; Madhaven and Grover, 1998). Furthermore, the benefits of anonymity, ease of the submission process, and transparency and joy of competition that idea markets provide may encourage employees to participate (van Dijk and van den Ende, 2002).

Group Decisions to Filter New Product Ideas

Idea filtering mechanisms require the identification of (1) the information to use in the filtering decision (stimuli design), (2) the type of respondents whose opinions will inform the filtering decision (respondent selection), and (3) the method for eliciting opinions (response measurement) (see Klink and Athaide, 2006). Therefore, these three decisions for idea filtering are discussed in the context of this article.

Stimuli design. During the idea selection stage, new product ideas can be represented as mere written descriptions, supported by figures and perhaps simple models (Urban and Hauser, 1993). The main goal is to outline the basic idea of the new product, provide some information

about possible market segments, and determine potential benefits for customers. On the basis of the stimuli design, decision makers can evaluate and filter new ideas.

Respondent selection. This selection process predominately centers on the evaluators' expertise in evaluating new product ideas. However, it may be difficult to ascertain the best or most knowledgeable experts. Results from forecasting studies indicate that the use of several experts instead of one is advantageous (Armstrong, 2001). If only a few experts evaluate new product ideas, the chances of failure increase. In addition, few experts are unlikely to make life-or-death decisions about a new product idea, because managers and consumers, as well as experts and novices, often disagree systematically in their selections of product ideas or concepts (Moreau, Lehmann, and Markman, 2001). Therefore, the inclusion of multiple, various evaluators appears beneficial for the idea selection process. Within a company, these evaluators may represent different organizational functions, such as marketing, R&D, and production.

Response measurement. To filter ideas, evaluators might rate ideas on prespecified criteria, such as strategic fit and importance, product and competitive advantages, market attractiveness, core competencies leverage, technical feasibility, or financial reward versus risk (Cooper and de Brentani, 1984). They also could use scorecards to summarize multiple criteria for an idea rating (Cooper, 2008). However, the use of multiple criteria poses the problem of determining the weights for the different criteria, which can be addressed by systematic procedures such as the analytic hierarchy process (Calantone, di Benedetto, and Schmidt, 1999). An alternative to the use of multiple criteria is a holistic measure of overall idea quality, such that evaluators vote on or rank several ideas. Open idea competitions usually employ voting mechanisms and work to attract as many votes as possible (Piller and Walcher, 2006).

As previously noted, using multiple experts for idea selection is advantageous, compared with the use of a single or very few experts. However, the evaluation measurements gathered

from multiple experts demand some form of aggregation. One possibility is to consider the average across all experts, with an equal weighting, though previous research has demonstrated that unequal weighting (e.g., based on the experts' confidence) often provides superior forecasts (van Bruggen, Lilien, and Kacker, 2002). The Delphi process (Rowe and Wright, 1999) and the market mechanism in idea markets offers other alternatives for aggregating the evaluations of several experts.

Interactions among evaluators also should increase the quality of their evaluations. Interactive and iterative evaluation techniques, such as the Delphi method, enable participants to learn from one another and improve overall decision quality (Rowe and Wright, 1999). Diversity in expertise also enhances the accuracy of the decision (Ozer, 2005). Thus, it is beneficial to include many experts in the idea evaluation processes and allow these experts to interact with one another, though the threat of groupthink might limit the benefits of group decisions and yield biased results (Kumar, Stern, and Anderson, 1993).

Integrating Sourcing and Evaluating New Product Ideas

The combination of idea sourcing with idea evaluation offers the benefit of giving idea contributors immediate feedback on their ideas. Furthermore, immediate screening and filtering out of obviously inferior ideas reduces the number visible in the system at any particular point in time, which minimizes the chances of information overload and cognitive inertia (Pinsonneault and Rivard, 1998). If all evaluators can see the multitude of poor ideas, the individual costs of screening likely increase, which should lower their motivation to complete idea evaluation tasks and may diminish the average quality and perceived usefulness of the method. The more accurate the initial screening decision, the more resources can be allocated to an in-depth analysis and the implementation of a few good ideas (Majchrzak, Cooper, and Neece, 2004).

In addition, immediate feedback might help potential idea contributors improve the quality of their new product ideas and provide them with an incentive to submit better ideas, which can further reduce the costs of idea screening. Toubia (2006) shows that individually customized incentives that reflect the impact of the participants' ideas improve the quality of new product ideas and reduce the screening costs for a large number of ideas. The success of idea competitions also might depend on the competitive nature of earning evaluations and rewards for good ideas (Piller and Walcher, 2006). Combining idea sourcing and idea evaluation also should help identify the best decision makers for the idea evaluation step, because participants who source new product ideas tend to possess relevant knowledge about these products and should have strong assessment abilities as well (Schreier, Oberhauser, and Prugl, 2007; Schreier and Prügl, 2008). Integrating these participants therefore should have a positive influence on the successful evaluation of new product ideas.

Idea Markets and Prediction Markets

Idea markets can integrate many idea contributors and evaluators who source and filter ideas. They build on the notion of prediction markets, also called information markets (Hahn and Tetlock, 2006) or virtual stock markets (Spann and Skiera, 2003), which attempt to connect a group of participants together in a virtual marketplace and enable them to trade shares of virtual stocks. In prediction markets, these stocks represent a bet on the outcome of future, uncertain events, and their value depends on the realization of the events (Forsythe et al., 1992; Spann and Skiera, 2003). For example, a stock may represent the predicted number of sold units of a new product (e.g., iPhone) in the first quarter after its market introduction. After the outcome of the specific event becomes known (i.e., actual number of units sold), each share of virtual stock receives a specified cash dividend (e.g., $1 for each 1,000 product units sold). Participants in a

prediction market use their own assessments about the expected event outcome and its corresponding cash dividend to derive an expected stock value and trade accordingly. For example, a participant's expectation that 100,000 iPhones would sell during the first quarter after its market introduction corresponds to a cash dividend of $100. If the current price of the corresponding stock is $95 ($105), the stock appears undervalued (overvalued) to this participant, so he or she should try to earn the anticipated profit of $5 by buying (selling). The participant's information thus affects the market price through his or her trading behavior.

Such prediction markets initially were applied in the form of political stock markets (later called the Iowa Electronic Market) to predict the outcome of the 1988 U.S. presidential election, with participation restricted to members of the University of Iowa community (for a more detailed description, see Berg, Nelson, and Rietz, 2008; Spann and Skiera, 2003; Wolfers and Zitzewitz, 2004). In the ensuing two decades, prediction markets have achieved promising results for short-term forecasting tasks, such as political events (Berg, Nelson, and Rietz, 2008; Forsythe et al., 1992; Wolfers and Zitzewitz, 2004), sports competitions (Luckner and Weinhardt, 2007; Servan-Schreiber et al., 2004; Spann and Skiera, 2009), business events (Elberse, 2007; Foutz and Jank, 2009; Gruca, Berg, and Cipriano, 2003; LaComb, Barnett, and Pan, 2007; Spann and Skiera, 2003), and the identification of lead users or experts (Spann et al., 2009). The theoretical foundation for prediction markets is the market efficiency attained in a competitive market through the price mechanism, which Hayek (1945) considers the most efficient instrument for aggregating asymmetrically dispersed information possessed by various market participants. Prices in efficient markets always fully reflect the available information (Fama, 1970), so the prices of virtual stocks serve as good predictors (Spann and Skiera, 2003).

The main objective of idea markets is to create a virtual market in which participants can suggest new product ideas, represented as idea stocks, and collectively filter and evaluate those

ideas by selling and buying idea stocks. A market mechanism adjusts the corresponding prices, which serve as indicators for the possible success of the different new product ideas. The most important distinctions between idea markets and prediction markets are as follows:

1. The initiator in traditional prediction markets determines the number of available stocks, whereas this number varies in idea markets, depending on the number of new suggestions by participants. For example, in a political stock market, the initiator would create two stocks for the 2008 U.S. presidential election: McCain and Obama. In an idea market though, participants can propose an unlimited and previously unknown number of different stocks that reflect their different ideas.
2. The value of the stocks in an idea market cannot depend on the realization of an actual event outcome in the near future.

Thus, the major difference between idea markets and preference markets (Dahan, Soukhoroukova, and Spann, 2010) or concept markets (i.e., securities trading of concepts; Dahan et al., 2006) is that the number of available stocks is governed by the initiator of the concept or preference market, whereas the participants in idea markets propose and filter the new product ideas, which are then traded. Idea markets are distinctive because they deal with an unknown number of different stocks.

Empirical Study

Aim of the Study

This study empirically explores the feasibility of an idea market in a real-world setting, as well as its ability to source, filter, and evaluate new product ideas. The advantage of a real-world study is that feasibility can be measured by participants' willingness to contribute new product ideas to the idea market, the evaluation of these ideas, and the idea market's ability can be

measured, at least partly, by indicators of the commercial success of the new product ideas. Therefore, the authors of this article have collaborated with a large technological company that operates in more than 100 countries, with revenues of more than US$2 billion in 2006, 90% of which came from high-tech B2B products, with 80% of its earnings from outside its home country.

The idea market allows employees of the company submit and evaluate new product ideas and promising technologies. Three different stock categories were established (see Table 1), such that the market asked the employees to identify (1) new technologies for the company 10 years in the future (i.e., technological forecasting), (2) new product ideas for a specific product category, and (3) innovative product and business ideas for the company. For confidentiality reasons, we cannot provide details about the specific product category or product and business ideas. For stocks in the first category, the price of an idea stock reflects the estimated percentage of revenues that would be influenced by the technology in 10 years. For those in the second category, the price depends on the estimated number of units of the product that would sell in 10 years. The last one is a miscellaneous category for product and business ideas of any kind, in which the 10 best ideas were worth 100£ in virtual currency and 0£ otherwise (for the ease of exposition, '£' is used to refer to the virtual currency). In the first and last categories, the numbers are scaled on a [0.01£; 100£] interval. To determine a similar price range for the second category, 1£ was set to correspond to 10,000 units in sales, because the executives estimated maximum sales of about 1 million units per year for a product in this category.

== Please insert Table 1 about here ==

Information about the actual market success in this case will not be available for another decade. Previous studies have suggests several ways to handle the cash dividend in this situation. For example, the Foresight Exchange (www.ideosphere.com) requires participants to wait for

their payment until the event occurs in the future, which might be up to 50 years from now. This method seems to work for the Foresight Exchange, but the incentives might diminish too much in the business-based research setting of this article. Dahan et al. (2006) use the last traded price when a market closes at a random point in time, and LaComb, Barnett, and Pan (2007) employ the volume-weighted average trading prices to determine the cash dividend of the stock. But the absence of an externally determined cash dividend might lead to herding behavior and self-fulfilling prophecies (Smith, Suchanek, and Williams, 1988). A third alternative is to use a proxy measure, such as the number of hits on search engines or quotes in bibliographic databases (Daim et al., 2005; Mangold et al., 2005). This method is easy to implement, but its quality depends heavily on the proxy measure, and participants in idea markets are likely to gain access to relevant information about such a measure. Furthermore, such measures often are not available for new products. Finally, a fourth alternative is to use an expert committee that determines the cash dividend for a share of stocks. This alternative is relatively easy to implement and avoids the risk of herding behavior. However, the participants might question the experts' knowledge and express disappointment if they do not agree with their decisions.

An expert committee was used to determine the cash dividends of stocks, because it avoids herding behavior and provides a flexible and easy-to-communicate way to determine cash dividends. Participants in the idea market did not know the members of the expert committee personally, so that the likelihood that they would attempt to appeal to their personal preferences seemed low. This expert committee consisted of four experienced persons who were not employed by the company: two R&D directors (one of another large technological company and one of a small technological company), a director of a major strategy consulting company, and a CEO of a venture capital company. They individually evaluated the product ideas and

determined a cash dividend for each idea stock; they also discussed their evaluations during a half-day meeting during the last week of operation of the idea market.

Description of the Idea Market

The idea market lasted 36 days and was open to all regular employees. The Web application provided a look and feel similar to those in real financial markets. The user interfaces, in German and English, were adapted to match corporate design conventions to ease the training for novice users. Because the company did not have any experience with an idea market, the authors provided their own software, which has been applied in several projects before. Prior to the start of the idea market, a clear explanation of the rules and rewards appeared in the corporate monthly newsletter, as well as on the idea market Web site. The idea market linked to the corporate intranet, and e-mails sent to employees contained an address in the central e-mail directory. Flyers were distributed in factories to reach the blue-collar workers as well. Users could only register through the intranet with a self-selected user name and randomly generated password. A short, five-page tutorial and user instructions were available online, as was a discussion board. The idea market used a virtual currency that could not be exchanged for a real-world currency, participation was free of charge, and participants could trade with the virtual currency. Each registered trader received 10,000£ virtual cash to start.

The best 10 traders received prizes worth US$3,000 in total, ranging from US$100 to US$1,500. This tournament-based incentive may create a tendency to engage in more risky trading behavior, but it is easy for participants to understand and has produced effective results in previous studies (Servan-Schreiber et al., 2004; Spann and Skiera, 2003). Servan-Schreiber et al. (2004) find no differences between real money and tournament-based play money incentives. In addition, idea submitters had additional incentives, in that the persons who submitted the first 25

idea stocks received gift certificates worth US$30, and those who submitted later earned US$12 certificates. Furthermore, the corresponding idea submitter earned an additional 1,000£ for his or her virtual portfolio. These additional incentives, which are not influenced by risky trading behavior, should help diminish the potential adverse effects of tournament-based incentives.

The idea filtering and evaluation steps used the two-stage screening process described in Figure 1. Every participant could suggest new product ideas, as long as the product would be "new to the idea market" (first come, first served principle) and "new to the company," such that it had not been developed or sold as a product yet. The company did not want participants to jointly develop or improve new product ideas that already had been suggested. However, no other formal restrictions were placed on how the participants could describe their new product idea. They also could enter external links, quote other publications, or upload images or sketches.

Each new product idea became an idea stock candidate, offered to the participants of the idea market through a uniform price, initial public offering (IPO) mechanism. During the next seven days, the shares of idea stock candidates could be ordered for 5£ in virtual currency each. If the new product idea reached the threshold quantity, it successfully passed through the filter and became an idea stock that would be traded on the market; otherwise, it was dropped from the list of idea stock candidates but remained visible on the Web site. To lessen the possibility of collusion and limit the influence of single participants on the IPO, each trader could buy a maximum of 4,000£, equivalent to 800 shares of each idea stock candidate. The threshold quantity for a successful IPO was adjusted to three levels, taking into account the growing number of market participants: 20,000£ for 0–50, 30,000£ for 51–150, and 40,000£ for more than 150 active market participants. Suggestions for new product ideas were no longer possible after the 24th day of the idea market.

== Please insert Figure 1 about here ==

The initial price for each stock was 5£. To calculate the subsequent price for each share of stock, an automated price adjustment rule was used, such that traders could buy and sell the idea stock at the price shown at any time. To boost the trading of early traders and provide examples for idea stocks, the idea market started by introducing ten ideas collected by the innovation team, seven in the form of idea stocks and three in the form of idea stock candidates.

Evaluation Criteria

Four categories of criteria are used to evaluate the success of the idea market: (1) acceptance of the idea market, (2) quality of the idea sourcing and filtering, (3) quality of idea evaluation, and (4) overall performance (see Table 2). Because it takes the focal company several years to develop and introduce new product ideas to the market, the commercial success cannot be used as a measure of the quality of the new product ideas. Subjective evaluations from both participants in the idea market and managers are used instead (for a discussion, see Wierenga, van Bruggen, and Staelin, 1999). Specifically, a survey was conducted with 25 senior managers ("management survey" hereafter), who had an average of nine years of industry experience, one week before the end of the idea market. This timing helped avoid an influence of the expert committee's judgments on managers' evaluations. The survey of participants in the idea market ("participant survey" hereafter) took place two weeks after the end of the idea market and achieved complete responses from 118 participants to the online questionnaire (38% response rate). No significant differences emerge between survey respondents and nonrespondents with respect to their interest in the idea market (i.e., measured by the number of page views), trading activity (number or size of trades), or market performance (final portfolio value).

== Please insert Table 2 about here ==

Results

Acceptance of the idea market. Of the 642 participants who registered for the idea market, 576 logged in at least once. The 36,435 trades made included 397 participants who executed at least one trade or submitted at least one product idea. The vast majority of registered participants (86%) came from the company's home country, perhaps because of their greater access to a PC with an Internet connection. The remaining 14% of participants came from 16 different countries, which suggests the idea market can draw interest from a diverse group of participants. On average, 157 participants actively traded in the idea market on work days, and this number remained fairly constant during the five weeks of the idea market. The continuously high transparency and interest among participants provides a good indicator of a successful prediction market application (Hahn and Tetlock, 2006; see also the discussion at www.pmcluster.com). During the 24 days of the idea submission period, 128 traders (33% of all active traders) suggested 252 unique product ideas (the idea submission period ended on a Friday (24th day of the idea market), to reflect the IPO period of 7 days). The maximum number of ideas suggested by a single trader was eleven, three of which made an IPO. Only a few ideas contained images, and most involved general descriptions with a maximum length of two pages (average length = 748.2 letters [σ = 613.8], or approximately 90 words). As Figure 2 shows, 77.1% of all ideas were submitted during the first 10 days of the idea market, and 67.6% of all idea stocks were available for trading within the first two weeks.

== Please insert Figure 2 about here ==

On average, the participants traded 14.7 (σ = 15.4) different idea stocks and studied 37.8 (σ = 42.5) different idea stock descriptions. A majority (60%) of the participants were not currently involved in new product development in their work, and 55% of the idea submitters

had never suggested a product idea before. These idea submitters also stated that the probability they would have suggested ideas without the idea market would have been only 25.4% (i.e., 74.6% of ideas would not have been proposed without the idea market). Furthermore, 89% of the respondents to the participant survey stated that they would participate again (i.e., scores of 5–7 on a seven-point Likert scale, $\mu = 6.1$; $\sigma = 1.5$; $p < .01$). For the survey results, p indicates the level of significance for the mean difference from the midpoint of the scale (4). Unless specified otherwise, the scale is always a seven-point Likert scale from 1 ("completely disagree") to 7 ("completely agree").

Respondents also affirmed that the idea market was fun ($\mu = 5.7$; $\sigma = 1.5$; $p < .01$). The extrinsic incentives for successful participation were rather low, and the participants evaluated the appropriateness of these incentives for encouraging them to submit ideas at a mean value of 4.7 ($\sigma = 1.6$; $p < .01$), and the importance of the rewards for participation earned only a 3.9 score ($\sigma = 2.0$; n.s.). They would have proposed their ideas (67.5%) on the idea market even if there were no rewards. These results are in line with previous research into the motivation of employees that shows that extrinsic incentives are not as important as intrinsic motivations (Griffiths-Hemans and Grover, 2006). On the measure of motivation derived from the desire to support the company, the average score of 5.7 ($\sigma = 1.5$; $p < .01$) highlights the low importance of extrinsic motivation.

These results also indicate the feasibility of idea markets for sourcing, filtering, and evaluating new product ideas in real-world settings. The number of participants is high, and the idea market draws interest among employees from various functional responsibilities, whose interest does not wane during the five weeks of operations (Figure 2). More than half of the ideas came from participants who were not involved in the new product development process, which

indicates that the idea market attracted a lot of interest from employees who otherwise would not have submitted or evaluated new product ideas.

Quality of idea sourcing and filtering. The evaluation of the quality of the ideas uses the share of ideas finally traded as idea stocks on the idea market, as well as senior management's evaluation of their quality as criteria. Of the 252 ideas submitted by 128 participants, 39 offered ideas for new technologies, 49 involved specific product ideas, and 164 pertained to product and business ideas. The 100 (40%) ideas that successfully passed through the filter to be traded as idea stocks consisted of 22 (56%), 21 (43%), and 57 (35%) ideas, respectively, from those three categories. That is, the idea market filtered ideas by both rejecting and supporting various ideas.

The senior managerial evaluation pertains to the average quality of the 20 best ideas in each category and indicates average values of 4.9 ($p < .01$), 4.3 (n.s.), and 5.0 ($p < .01$) for the three categories, respectively. The participant survey also asked about the idea market's ability to stimulate ideas, and 64 of the 118 respondents indicated that they had submitted at least one idea. Participants agreed that other ideas on the idea market stimulated them to submit their own ideas ($\mu = 4.5$, $\sigma = 2.0$; $p < .05$), in that 54.7% of respondents scored high (5–7 on seven-point scale) on this measure. Many ideas would not have been sourced without the idea market.

Quality of idea evaluation. The assessment of the quality of idea evaluation uses the activities in the market to value idea stocks, participants' and senior management's assessments of the evaluation of the market, and the level of agreement between the evaluation from the idea market and that from the expert committee as criteria. The average number of traders per idea stock is 46.2 ($\sigma = 30.4$), and the average number of trades is 334.3 ($\sigma = 261.5$). The top ten idea stocks in the three categories prompted averages of 91.1 ($\sigma = 39.6$), 48.5 ($\sigma = 20.2$), and 95.9 ($\sigma = 29.7$) different traders who engaged in 709.2 ($\sigma = 282.5$), 312.3 ($\sigma = 202.0$), and 734.6 ($\sigma =$

341.7) trades. These values indicate that the stocks were frequently traded by a sufficient number of traders. There is a positive correlation of .23 ($p < .01$) between the number of submitted ideas by a market participant and his or her trading volume, which provides a measure of trading activity. This positive correlation indicates no clear distinction between the submitters and evaluators of ideas.

The participants strongly agreed with the statement that it was good that all participants could evaluate ideas ($\mu = 5.9$; $\sigma = 1.6$; $p < .01$). The senior management also assigned a value of 4.4 ($\sigma = 1.9$; n.s.) to the statement that the idea market made reliable predictions about future market success and a value of 4.8 ($\sigma = 1.3$, $p < .01$) to the statement that the idea market could improve success forecasts for new product ideas. Furthermore, they stated that a final decision about the ideas should take the results of the idea market into account ($\mu = 5.2$, $\sigma = 1.3$, $p < .01$).

Participants who submitted at least one idea were more active and successful traders, who conducted more purchase orders ($\mu_{submitters} = 99.1$, $\mu_{non\text{-}submitters} = 36.3$, $p < .05$) and sale orders ($\mu_{submitters} = 84.4$, $\mu_{non\text{-}submitters} = 41.5$, $p < .01$) than non-submitters. Furthermore, they achieved a significantly higher portfolio value ($p < .01$) before and after the determination of the final cash dividends by the expert committee than did non-submitters.

Idea submitters may be biased in their trading behavior, in that they predominately trade their own idea (stocks). However, only 14.1% of submitters' purchase orders and 12.5% of their sales orders were for their *own* idea stocks, which indicates that idea submitters did not focus solely on promoting their own ideas. The analysis of their trading volume and portfolios yields similar results. Even if the submitters tried to promote their ideas, the ratio of transactions (or volume) of their own-stock trading is rather low, such that for each of the 100 stocks (without the

9 suggested at the beginning), only 6.58% of volume on average involves the idea submitters themselves.

The correlation between the judgments of the expert committee and the final prices in the idea market is .10 (n.s.) for the new technologies category, .36 ($p < .1$) for the specific product ideas, and .47 ($p < .01$) for product and business ideas. The idea submitters assessed the expert committee's evaluation as slightly worse than that of the idea market ($\mu = 4.4$ versus 5.0, $p < .01$). Yet agreement with the expert committee is far from high.

In summary, the idea market actively evaluates idea stocks, but the consensus among the evaluations of the idea market, senior management, individual participants, and expert committee is only moderate. This dissent also suggests the high uncertainty related to the prediction of success for new product ideas, which leads to the commonly observed failure rates of more than 50% for new product introductions, even after extensive market research (Ataman, Mela, and van Heerde, 2008; Urban and Hauser, 1993). The four experts partly disagreed in their evaluations, as the average coefficient of variation of 1.12 for the 48 stocks in the first two categories demonstrates. Despite all this uncertainty though, the vast majority of participants (81%) accepted the procedure by which the expert committee determined the cash dividends.

Overall performance. The overall performance of the idea market reflects participants' and senior management's assessments of its performance. The participants and senior managers perceived that the idea market was useful for the company ($\mu = 5.3$; $\sigma = 1.4$; $p < .01$ and $\mu = 5.1$; $\sigma = 1.1$; $p < .01$, seven-point Likert scales). The senior management group confirmed that the idea market should be conducted again ($\mu = 5.7$; $\sigma = 1.5$; $p < .01$), and 84% would recommend the use of idea markets to other companies. Perhaps the most important positive influence on

recommendations is how managers perceived the newness of the best 20 ideas compared with the competition ($p < .05$).

In addition, discussions with executives of the company revealed that the idea market involved more employees in the new product development process than any other method in the past had ($\mu = 5.9$; $\sigma = 1.0$; $p < .01$). As previously noted, a high proportion of 89% participants stated that they would participate again in the idea market ($\mu = 6.1$; $\sigma = 1.5$; $p < .01$), and 57.6% of the participants testified that it increased their interest in new product development.

Because of the very long product development periods for this company, it is still too early to evaluate the commercial success of the new product ideas that were sourced by the idea market and, thus, its monetary impact. In addition, the company's policy is to not provide any information about products that are under development. However, it can be revealed that several product ideas from the idea market are undergoing further development. In addition, the manager responsible for initiating the projected was promoted after the end of the stock market, and the idea market project team won a corporate award. The award particularly highlighted the idea market's unique ability to integrate employees from all over the world. No similar award had ever been given for any other new product development method.

Summary and Conclusion

The results of this article indicate that idea markets can be a valuable tool to support new product development. The empirical study demonstrates the feasibility of an idea market in a real-world setting, as well as its ability to source, filter, and evaluate new product ideas and promising technologies. The idea market attracted participants who exhibited high involvement across functional levels and different subsidiaries of the company. Overall, the company's management and participants positively evaluated the method's usefulness as a tool for idea

sourcing, filtering, and evaluation. The corporate award provided to the project team by top management also underlines the usefulness of the idea market for the company. Finally, more than half of the participants stated that the idea market increased their interest in new product development and that they would participate again. Although the additional benefits driven by this increased interest cannot be quanitfied, they are likely to lead to further improvements that are not reflected in the reported results.

Managerial Implications

The results of this study have several important managerial implications. Barczak, Griffin, and Kahn (2009) emphasize that the one task in which companies seem least effective is managing their idea generation, compilation, and distribution. Ideas have a short lifespan in an organization, and if not appropriately captured, they may disappear. Idea markets offer a formal process to capture, select, and distribute ideas in an organization, which may address the concerns raised by the managers surveyed by Barczak, Griffin, and Kahn (2009).

The importance of sourcing ideas before they fade away is effectively highlighted by the finding that more than 70% of the ideas submitted to the idea market would not have been proposed otherwise. Therefore, the dominant focus of idea management on creation and selection may ignore an important aspect of sourcing from different groups. Efficient sourcing demands a platform to motivate employees to communicate their ideas and exchange and express their opinions. For example, van Dijk and van den Ende (2002) recommend that companies should keep communication channels open to facilitate information transfers within and across functional groups.

A platform that integrates idea sourcing with idea selection also reduces the necessary management effort to select ideas, because the platform already performs this task. By

effectively sourcing and contemporaneously filtering, idea markets help reduce the number of ideas brought to management's attention to those that seem worthy of further consideration. Because idea markets also have the ability to source many ideas, they can increase efficiency at the fuzzy front end of the new product development process.

In addition, the high interest and level of participation among employees demonstrates that idea markets enhance the innovative culture in a company by connecting all employees, around the world and across different divisions. Idea markets provide an effective communication channel for gathering current opinions and trends within the company. Although these additional benefits are not as easily to measure as the ideas themselves, they may be equally important.

Limitations and Directions for Further Research

Although the idea market design in this study yields some promising results, this real-world implementation does not test different market designs. It used play money and the extrinsic incentives were rather small; even though they seemed to have worked well, we did not test other incentive schemes or different incentives for idea sourcing and idea evaluation. The same reasoning applies to the choice of trading hours, the duration of the market, the formal requirements for the new product ideas submitted, and the target group of participants. Therefore, additional research should investigate the performance of alternative designs of the idea market (Spann and Skiera, 2003). Researchers also might analyze alternatives to the use of an expert committee to determine the final stock prize and thus the portfolio value of the participants. For example, Dahan et al. (2006) recommend using final stock prices to cash out the stocks, though doing so might incur some herding behavior. In addition, participation was limited to the employees of the company; further research should explore the advantages and disadvantages of including suppliers, consultants, or customers as well.

Another potential path for ongoing research might include the additional benefits of idea markets pertaining to the greater involvement of the employees in new product development because of their participation in the idea market. Additional research could analyze whether the combination of idea markets with idea creation methods is effective. For example, brainstorming methods might create ideas that the idea market then can evaluate. Researchers could look for ways to enhance the idea sourcing and generation process to enable participants to collaborate and jointly develop or improve suggested new product ideas. Idea markets and experts also provide different information sources that might be integrated to achieve even better forecasts.

The long development times for this high-tech company permit only subjective estimates to evaluate the quality of new product ideas, though the estimates might not correlate perfectly with the future commercial success of new product ideas. Furthermore, we could not collect data about individual work characteristics, personal traits, or the social networks of traders, due to legal restrictions, though these features would be interesting to investigate to find insights into the individual motivations and abilities to submit and evaluate ideas.

Finally, we cannot compare the performance of the idea market with other methods for sourcing and evaluating new product ideas. The company’s goal was to encourage all employees to participate in the idea market. This commitment, including the significant investment in the execution of the idea market, especially in terms of employees' time, and the corporate award for the idea market project team, implies that the company was not too happy with its existing product development methods. It clearly considered the idea market a valuable alternative.

Table 1: Forecasting Tasks and Determination of Cash Dividend of Stock Categories in Empirical Study

Category	Forecasting Task	Determination of Cash Dividend
New technologies for the company [technological forecasting]	Percentage of revenues influenced by the respective technology in ten years	Expert committee estimated the percentage of revenue of the corresponding new technology; each percentage point was equivalent to 1£.
New product ideas for a specific product category [specific new product ideas]	Number of units that will be sold in ten years from now	Expert committee estimated the number of units to be sold in ten years; 10,000 units were equivalent to 1£.
Innovative product and business ideas for the company [general new business and product ideas]	Predict the most innovative product and business ideas	Each member of the expert committee selected the 10 best ideas according to his or her assessment. Then, 10 ideas with the highest score were worth 100£, and the remaining ideas were worth 0£.

Table 2: Evaluation Criteria for the Idea Market (Empirical Study)

Evaluation Category	Measure and Data Source
Acceptance of Idea Market	· Number and development of the number of participants (data from idea market) · Number and development of the number of trades (data from idea market) · Number and development of the number of idea stocks (data from idea market) · Participants‘ interest (participant survey) · Share of idea submitters who had never suggested a new product idea before (participant survey) · Share of participants who are not involved in the new product development (participant survey) · Willingness of repeated participation (participant survey)
Quality of Idea Sourcing and Filtering	· Quality of ideas (management survey) · Share of idea suggestions that were traded in the market (data from idea market) · Ability of idea market to stimulate ideas (participant survey and management survey)
Quality of Idea Evaluation	· Number of trades per idea stock and number of trades of top 10 idea stocks in a category (data from idea market) · Participants' assessment of idea market's evaluation (participant survey) · Management evaluation of idea market's ability to improve forecasts of new product success (management survey) · Consensus with experts (data from idea market)
Overall Performance of Idea Market	· Perceived usefulness (participant and management survey) · Interest for new product development (participant survey) · Overall evaluation of the idea market (management survey) · Management's recommendation of idea markets (management survey) · Repetition of the idea market (management survey) · Willingness to participate once more (participant survey) · Ability of idea markets to involve employees in the new product development process (management survey)

Figure 1: Screening Process for Floating New Product Ideas

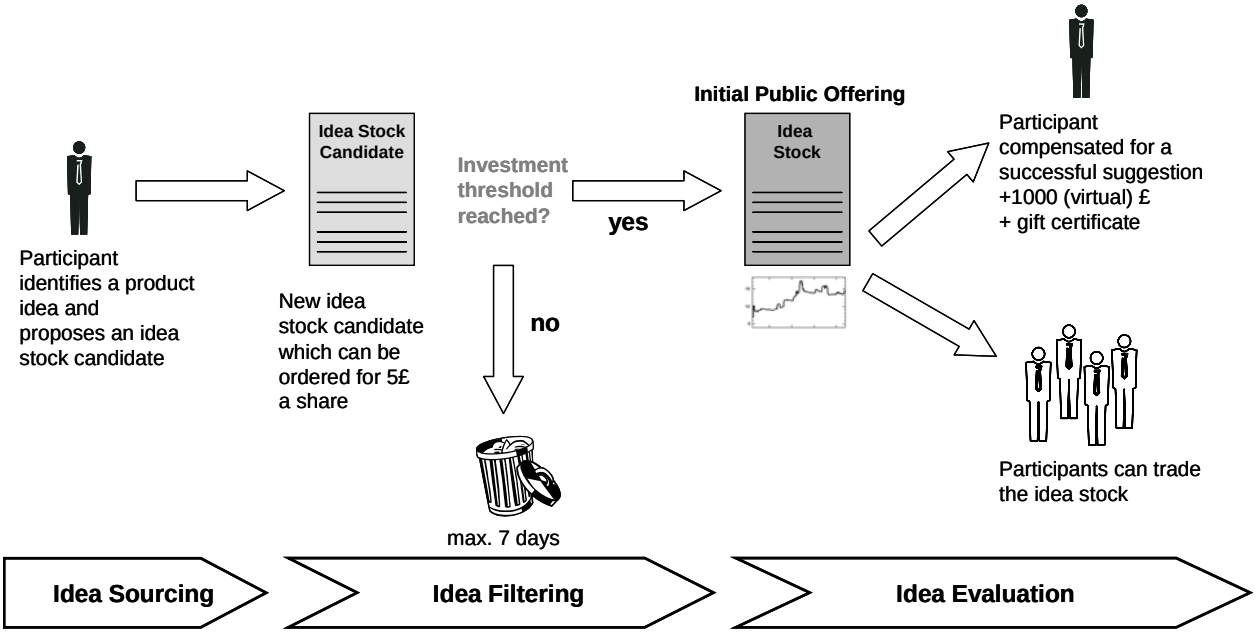
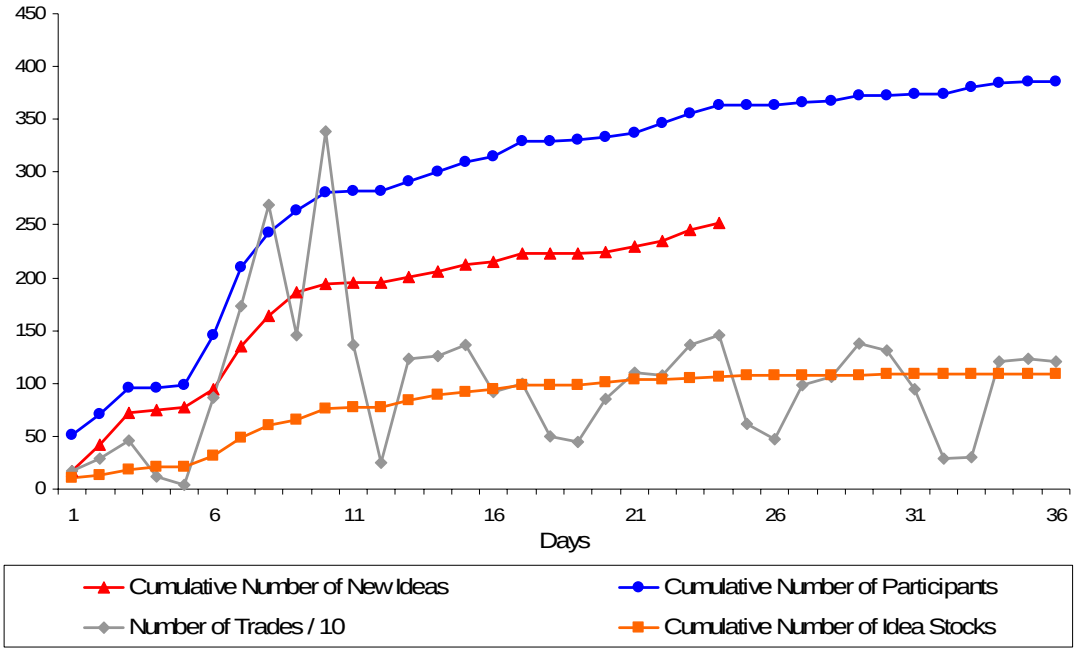


Figure 2: Overview of Trading Activities in the Idea Market



Notes: Weekends fall on days 4 and 5, 11 and 12, 18 and 19, 25 and 26, and 32 and 33.

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