

Supporting Technology Commercialization for SMEs: A New Service Model to Support Idea Generation in the Product Development Process

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Abstract—This study proposes a research model based on a Governmental initiative that aims to increase the success of commercialization for technology-oriented SMEs. It particularly focuses on supporting the identification and development of innovative product ideas. Although the success of a new product is dependent on the customers' satisfaction, technology entrepreneurs often pay significantly less attention to their commercialization strategy as opposed to their technological innovation. This paper considers crowdsourcing as an effective method to overcome this. Based on this assumption, customers can aid the development of an idea for a new product through their own needs, ultimately driving successful commercialization. Furthermore, the paper provides some key insights to support small and medium sized firms and proposes a new service model with an open platform that facilitates crowdsourcing. It particularly focuses on the early stage of the new product development process, indicating how such a platform, with Governmental support, can be used in a variety of business areas.

Index Terms—crowdsourcing, open platform, technology commercialization, public service model, new product development (NPD)

I. INTRODUCTION

During the new product development (NPD) process, small and medium sized technology-oriented enterprises do not sufficiently consider their commercializing strategy. However, it is important that they are mindful of the full NPD process from the initial idea generation stage to selling rather than focusing solely on the technology development. Particularly in Korea, where this work was undertaken, Small and Medium sized Enterprises (SMEs) led by engineers have a higher risk in terms of failing to understand the market needs [1]. For instance, despite potentially useful technology, such companies may often not grasp the complicated needs of their customers, preventing any success in the marketplace. Although the success of a new product is dependent on the customers' satisfaction, technology entrepreneurs tend to overlook these efforts.

Previously, studies have involved users in an area of innovation [2] and sought to anticipate market needs [3].

In a similar vein, SMEs can outsource idea generation to the 'crowd of users' and this can potentially provide promising insights for new concepts and ideas. Crowdsourcing can support SMEs to identify market needs and successfully make a new product. It enables companies to gather and utilize dispersed intelligence, providing access to specialized skills for product research and development (R&D). Meanwhile corporations are increasingly entering into partnerships with crowdsourcing platforms and many large companies try to apply diverse approaches to product R&D through open innovation including 3M and BMW [4]. Therefore, it is increasingly commonplace for leading and large corporations to open source specialized knowledge. For SMEs with weak commercializing strategies, open sourcing specialized knowledge may provide a cost-effective and viable strategy of gathering required knowledge that may currently be beyond their resources. It offers them easy access to a wide array of information regardless of physical location and provides the possibility of collaboration. Specifically, the firm works with customers or professionals, which can inform the early stages of the NPD process. This is particularly important as Government support is limited meaning they can provide only temporary funds for product development [5]. Thus, SMEs can often experience a fragile support ecology and a lack of sustainable support.

This study is based on a Governmental initiative that aims to increase the success of commercialization for technology-oriented SMEs, particularly helping them to find innovative product ideas and support them to develop it. It examines a new approach to improving the commercialization strategy of SMEs through the provision of a platform where people can collaborate and bring together promising new product idea. Hence it seeks to create a service model that will support defining ideas and screening them for a new business item by gathering people, both professional and amateur, through an open platform.

A one-year research process has been conducted by Electronics and Telecommunications Research Institute (ETRI), a governmental research institute in Korea, to understand how SMEs can be better supported when commercializing ICT-related technology. This research explores the underlying needs of technology-oriented

enterprises to commercialize their technology successfully.

It identifies effective methods to connect crowds and SMEs together to facilitate the idea generating performance. A new service model was designed based on insights derived the field research focusing on key beneficiaries and the value proposition of the service. Following this, an open platform was created to deliver this new service.

II. BACKGROUND

Technology-oriented SMEs in Korea often have a high failure rate when seeking to build their competitiveness in comparison to more established enterprises in the market [6]. Despite many SMEs investing significant effort and assets into their development process, new products seldom satisfy their customers [7], [8]. Instead, a combination of limited resources and a poor commercialization strategy result in failure in the market in spite of this promising technology.

Many technology-oriented SMEs in Korea, however, do not have strategic commercialization processes in place especially for generating and screening ideas [1]. Instead, such firms, which are often led by engineers, focus on their technology competence at the expense of the state of the market. For example, a new product idea may emanate from the company director rather than from a specific process of idea generation, screening and product concept development and testing [1]. Thus, significant expense is focused on prototyping and mass production rather than understanding customer needs. In the same manner, Lagrosen (2005) compared the structure of the product development process, often based on the size of the company. According to his study, while large companies have specified manuals and cross-functional teams to help structure the NPD process, smaller companies are much less structured [8]. Meanwhile, having a closer relationship with customers is one of potentially useful strategies for commercially successful new products [2], [9].

For this reason, both academia and industry focuses on customer involvement during the product development process from the early stages of the NPD process [4], [10], [8]. Collaboration with customers, by involving them in the product development process, is effective in reducing costs and increasing the quality of the product [8]. Customers provide the critical information about not only the problems (needs) but also support the manufacturers by helping to identify potential solutions to these problems [10].

A. Crowdsourcing

This study examines crowdsourcing as one potential way of involving diverse users for generating a promising new product idea. Howe (2006) defined crowdsourcing as 'the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call' [11]. Crowdsourcing has been addressed in a variety of fields, including social

computing, collective intelligence and human computation [12]. Accordingly, industries have used crowdsourcing as a way to improve their specialized skills and also to better understand customer demand driving product development. Crowdsourcing is largely used for industry in four aspects such as, (1) Simple, Task-oriented crowdsourcing, (2) Complex, experience-based crowdsourcing, (3) Open-ended, idea-generating crowdsourcing and (4) Funding, consumption, and contribution crowdsourcing [4]. This paper focuses on the open-ended, idea generating crowdsourcing, which is about invention, idea generation and product and brand innovation. This aspect of crowdsourcing considers that the general public can contribute to breakthroughs in product development and innovation. Based on this idea, the model proposed in this paper considers customers as well as experts and developers where government-initiated R&D ought to engage small firms' needs.

Previous research has placed crowdsourcing as a tool to improve performance of data analysis [13] and product development [14]. Crowdsourcing has been used, both, to gather background knowledge and support analysis of data. This often involves relatively little effort from a group of volunteers, potentially including non-experts. One widely known example is CASCADE, which hires many unskilled laborers to produce taxonomies to build information architecture more efficiently [15]. This methodology was successfully used for a variety of research topics, including object detection [16] and breast cancer research [17]. Despite this viability, little research has explored how crowdsourcing may be used in other aspects, including in the context of technology commercialization. This study explores how crowdsourcing may be used to the public service model that aims to enhancing the commercialization strategies of SMEs in Korea.

III. METHOD

A one-year research study was conducted in 2013 to create a public service led by a Korean governmental research institute, ETRI. This aims to support SMEs when commercializing ICT-related technology. The research focused on defining how crowdsourcing works for such a Governmental service and identifying key features required to apply this when designing a new service model. The research team consists of a combination of service designers from outside of the organization and service providers within the organization. Firstly, the research explored the wider business environment in Korea by conducting 45 in-depth interviews. The interview process involved meetings with 20 ICT-related companies and 25 inner stakeholders who are related to service delivery working for ETRI. The companies were selected based on the condition of sales of their products, location, and the scale of the company (i.e. the number of employees and the scale of R&D part). In other words, the interview sought to understand the actual new product development system of technology-oriented enterprise, including idea generation system, partnership with third parties, technology R&D ability,

and marketing competency. The interviewees are the owner and product development manager of the companies. The interview groups consisted of 2 start-ups, in their first year of business, who are not currently making profits, and 23 medium-sized firms, between 4 and 19 years old, who are seeking to innovate and develop a new, profit-making product idea. Thus the interviewees who are situated in very different business cycles give diverse perspectives of commercialization from the point of view of new product development.

Following this, 25 in-depth interviews were conducted with service providers of the existing Governmental support. These aimed to explore the service ecology from the perspective of service providers such as the Governmental support provided for SMEs and resources. The interviewees were selected from ETRI with more than 10 years experiences of supporting technology commercialization. Each interview lasted about one hour and explored what the Government are currently doing and how that works. After information had been gathered through the interviews, affinity workshops were used to analyze the data. The Affinity technique is considered to be an effective method to synchronize different perspectives and analyze a large amount of data. The raw interview data was broken down to keywords, with the clustered information finally rearranged thematically, so the information was divided into common needs of the firms, desirable service model, resources available for delivering the service, and points of difficulty. Based on the insights from the Affinity Diagram the key service concept, benefits, and customers were further specified.

IV. INSIGHTS

Three key insights are focusing on the design of the idea-generation crowdsourcing platform and on the improvement of the Governmental support for SMEs commercialization. First, most of the technology-oriented SMEs run their business by manufacturing industrial products for large companies. In comparison to consumer products, which may be more familiar to the general public, industrial products including materials, components and capital equipment are often made for specific customers.

In essence it requires a different strategy for the new product development process [10]. According to von Hippel (1978), the development of industrial products needs a more customer-driven process to fulfill a specific purpose or meet a customer's specific request. In the case of industrial products development, products are often produced on request of customers or suppliers [10] so that these companies often struggle to share their technology information and find the new audience for their specific knowledge. In most cases, they make profits by manufacturing the products on demand because the order production has been considered as one of the important factors for their profit-making performance by maintaining a positive relationship with their customers. In terms of designing the service framework considering enlarged crowd of users, it ought to effectively convey general information to the public about the company and

more detailed information about the technology being used. Such specific technology should be translated into experience-based information to make users understand the base information of the platform, which has to been shown to be a critical element of their continuous participation in previous research [18].

Second, despite companies desiring a new product idea to extend their business, some concerns exist about sharing their particular technological innovation with others. For example, concerns have been raised about sharing such information with developers and customers who are not in their work processes to not compromise the security of their ideas or innovation processes. Sharing such information may make companies feel vulnerable to their idea being taken on by someone else. A prominent concern among the companies related to the credibility of partners when discussing their issues, even though a Governmental support service. The inner stakeholders highlighted that most companies require that their requests for support remain secret. However, this can subsequently constrain the support available. A more open request leads to fears of reputational damage, as it may imbue the feeling among others that the company is not capable of solving problems alone. This may be particularly prevalent among SMEs who manufacture industrial products for major companies, as reputation is often a key determinant of success in this area.

Finally, the product development process does not solely depend on idea generation. Rather, other aspects such as available human resources, R&D ability, and financial resources, all impact the product development process. Although idea generation through crowdsourcing may potentially improve the firms' commercialization strategy, the companies should manage the full NPD process before, during, and after the idea generation process [1]. From the perspective of the Government support, on the other hand, the Government should consider the firms are ready to develop their new product.

According to the public service providers' interview, the most important part of the public service is to screen the key beneficiary so that the most appropriate one can get the supports. In-depth interviews were particularly effective to explore internal issues, which provided an understanding of the company beyond its commercialization strategy. Studying the companies' internal situation is a critical element of the public service, especially when it comes to supporting their commercialization. Focusing on their business life cycle, financial conditions, the organization management system, and available human resources for NPD may provide vital information when identifying required support.

V. NEW SERVICE MODEL

This paper presents a new service model, based on the key insights identified through the research. The designed service employs an online platform that seeks to help SMEs collaborate with people who may provide necessary skills currently beyond their own resources. The aim of this service is to provide SMEs with an

opportunity collaborating with general public who can be potential customers and the professionals outside of the organization through this open platform. In general, the platform provides technology application challenges to the crowd with the needs-based information of the company. Users of the platform are able to explore the technology, challenge and the needs-based information, and to submit new product or service ideas to the company.

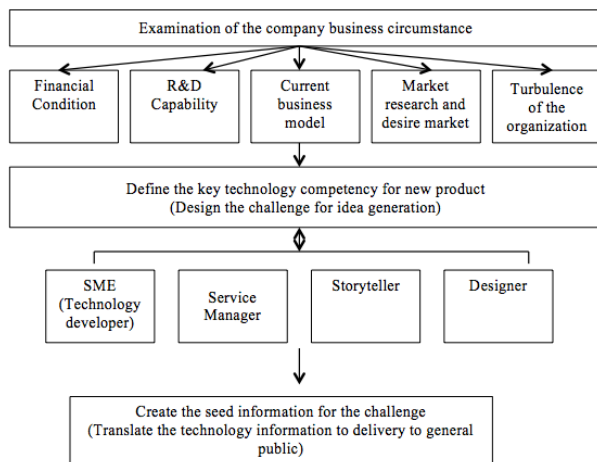


Figure 1. Preparation stage of the service model

The proposed service framework consists of two phases, i.e. the preparation stage and the service delivery stage through the open platform. This platform was developed through a Governmental initiative, meaning it is a free endeavor to support SMEs. Thus, the company undergoes an examination process to understand the business conditions particular to it and to customize the challenge with their information at the preparation stage Fig. 1. Five conditions were identified to better understand the companies including finance, R&D ability and availability, business model, market desire and turbulence of the organization. The financial and R&D conditions are examined to discover if the firm has sufficient resources to support new product development. It also aims to screen the most appropriate service beneficiary in terms of their needs, and timeliness for the new product development. As the service is based on the open platform, the new product idea should be followed by the next product development process, which needs, both, financial and R&D capabilities. Therefore, it is important that the company is in a healthy financial position to support prototype development and the mass production process and that they have the R&D competence to realize this new product. Meanwhile, the most important part of the preparation stage is articulating the technology information to communicate with the general users so that they can understand and generate new idea based on the newly gained knowledge.

A higher entry barrier for the knowledge in terms of both complexity of the industry or product and the level of knowledge depth might less encourage crowd to engage in the idea generation process [18]. Although the technology itself is unfamiliar to public, the function of those particular technologies can be illustrated by

reflecting the general use experience scenarios so that it facilitates the crowds to use the knowledge to imagine. There are several professionals to work on the translation of the information such as storyteller to describe the technology scenario, technology developer, and designer.

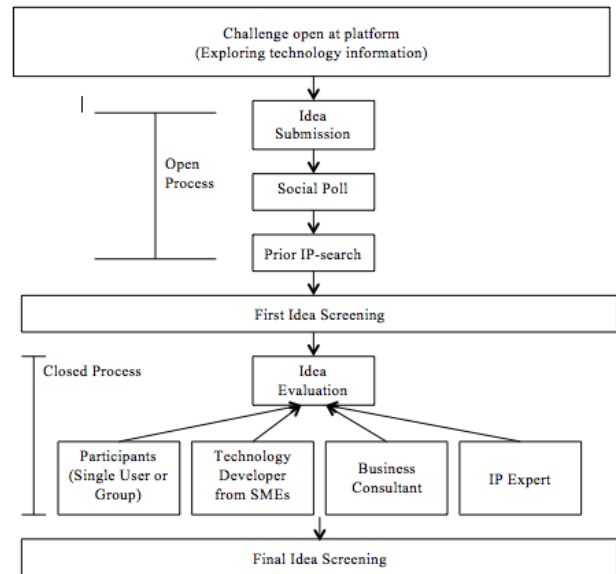


Figure 2. Service delivery stage of the service model

The idea generation process at the delivery stage is based on this newly created information. There are four steps of participatory idea development process through new platform Fig. 2. The first step is called 'open ideation' where the users can explore the challenges and submit their idea. It is open to others so as to evaluate idea together through discussion on the platform. As it is mostly application idea for the technology, the prior research is required for the submitted to if there is the similar business in market. Therefore, social poll is followed for every idea and prior art search is conducted based on the preference results. Once the open ideation is complete the selected ideas will be evaluated with diverse participants but at this stage, it only allows limited accessibility. There are multidisciplinary panel for this stage including the technology developers, business consultants and market research professionals to evaluate the initial idea being submitted at the early process. Still, the key role players consist of the participants who submit the idea and the panels. Collaboration is an important method for the open platform therefore the general publics are more motivated when they can work with professionals and when they are not single user of the evaluation process even though they simply proposed the concept idea. Hence, panels and team-mates of the platform have the limited accessibility for the idea evaluation process and they are confirmed for the security form before they take part. The final idea is selected among those from evaluation process.

VI. DISCUSSION & CONCLUSION

This study investigates the commercialization environment of technology-oriented SMEs. It provides

the background to the emergence of the new service model, including the limitations of these companies for their success commercialization in Korea. Crowdsourcing platforms have been often used for large-size companies to apply diverse approaches to product R&D but rarely for public services. The proposed service model in this paper aims to support commercializing ICT-related technology based on crowdsourcing with Governmental support. For SMEs with weak commercializing strategies, gaining specialized knowledge may provide a viable strategy, particularly for improving their market competency. This research focuses on how crowdsourcing may be a promising concept to support technology commercialization through the development of a public service model.

Hence, this paper proposes a public service model that seeks to facilitate the company's collaboration with the general public and external experts. It provides key insights when designing a public service for SMEs by supporting idea generation and identifies factors that should be considered for the design of an open-platform based service. Four basic conditions to screen the key target companies are identified, including financial and R&D, business model, market desire and within-company atmosphere. These factors may give some guide for the public service management especially for the commercialization supports. This study seeks to create a service model that will support defining innovative ideas and screening them for a new business item by gathering people, both professional and amateur through an open platform. Particularly, it is aiming to support the technology-oriented enterprises to better interact their potential customers as the existing industrial products development process is mostly led by limited manufacturing requests. By giving opportunity of involving non-expert public and experts at the early stage of NPD, it is expected to enhance commercialization ability of the idea proposed on the platform. We plan to explore motivation of heterogeneous participants around the use of the platform so that the proposed service model can be applied in a broad industry case in the further research.

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