

Crowdsourcing for Device Manufacturers in the Convergent Media Industry

Jaeheung YOO

Department of Internet Business, Kosin University, Republic of Korea

Kibaek LEE & Munkee CHOI

Graduate School of Innovation & Technology Management (I&TM),
Korea Advanced Institute of Science & Technology (KAIST),
Republic of Korea

Abstract: Crowdsourcing has been distinguished as an effective means of open innovation for collecting creative ideas from people who have various degrees of expertise and diversity in knowledge. Online platforms enable open innovation using the crowd in an efficient way in terms of cost and time management. Manufacturers in the convergent media industry have recently adopted crowdsourcing activities because understanding the variety of customers' hidden needs and identifying new market opportunities has become more critical to maintain a competitive edge in the market. However, it is difficult to empirically verify the effect of crowdsourcing activities on the market success of these device manufacturers. As such, this paper attempts to validate the effectiveness of crowdsourcing through qualitative studies including a literature review and case study analyses. As a result of the evaluations, several practical guidelines on how to integrate crowdsourcing into new product development processes are suggested for firms.

Key words: crowdsourcing, convergent device, open innovation, new product development, user innovation.

Rise of crowdsourcing

Crowdsourcing has been distinguished as an effective means of open innovation for collecting creative ideas from people who have various degrees of expertise and diversity in knowledge (HOWE, 2006). Online platforms enable open innovation using the crowd in an efficient way in terms of cost and time management (BONABEAU, 2009). Increasing numbers of firms are using online crowdsourcing platforms such as InnoCentive and NineSigma for the generation, refinement, or evaluation of ideas, opinions, and breakthrough technologies. Firms from gold mining operations to typical consumer goods manufacturers use online

crowdsourcing platforms. However, a fundamental question surrounding the use of crowdsourcing has arisen: is it always useful as a means of an open innovation activity? What if the firm is a highly technology-oriented firm whose competency largely relies on the advancement of existing technologies or products?

Crowdsourcing is generally known as an effective method for user innovation and identification of general customers' unmet needs or hidden desires for a particular product or service. However, there is uncertainty surrounding the effectiveness of crowdsourcing activities when compared with traditional methods used to source ideas and evaluate ideas in the process of product innovation in a technology-oriented firm where in-house R&D is preferred to user innovation. Thus, another question arises: are crowdsourcing activities necessary and valuable in the process of product innovation for device manufacturers in convergent media markets, and if so, how can firms use these activities to extract the maximum benefit? This paper answers these questions by focusing on the advantages of crowdsourcing compared with traditional in-house development and it suggests a framework for practice for device manufacturers.

Tech-push products and crowdsourcing

In high-tech industries, firms have incrementally enhanced their technology-intensive (or tech-push) products on the basis of their own technological trajectory. Tech-push describes a situation where an emerging technology or a new combination of existing technologies provides the stimulus for an innovative product and solution in the market (DOSI, 1982). Traditionally, firms that produce technology-intensive products rely on internal R&D resources and capabilities to identify and develop sustainable technologies.

Meanwhile, firms engaged in market oriented (or demand-pull) products actively use information about customers' requirements and desires from external sources. Market-oriented products imply that the product or process innovation has its origins in latent, unsatisfied customer needs in the marketplace. For these firms, it is crucial to identify the unmet needs or hidden desires of customers. In order to achieve this, firms have used focused group interviews (FGIs), online surveys, and information accumulated in call centres. However, these conventional methods are often

limited in terms of costs, biased thinking of internal employees, or voluntary participation of customers.

Furthermore, large manufacturing firms tend to rely on in-house R&D due to financial capabilities, highly skilled human resources, and accumulated internal technologies (SHEFER *et al.*, 2005). Incumbent manufacturers in the convergent media industry such as Nokia, Sony, Apple, and Samsung have shown similar patterns. They have traditionally preferred in-house development based on experts and employees' knowledge inside the firm rather than using external users' opinions. The open innovation activities of these firms are relatively recent phenomena as collaboration among firms in the value chain becomes more crucial for survival.

Today, incumbent and emerging manufacturers in the convergent media industry have achieved great market performance. The aggregated market share of Samsung, Apple, and Nokia is almost 60 per cent of the total smartphone market as of Q4 2011 (IDC, 2012). The success of these firms based on in-house R&D strategies appears to reflect the position that they do not need a crowdsourcing approach to source ideas and solutions from outside the firm for new product development (NPD) and improvement of existing products.

Therefore, the question is posed: is crowdsourcing necessary for firms selling technology-intensive devices? If the answer is yes, what are the valid benefits of crowdsourcing to the device manufacturers in the convergent media industry? Once the benefits are recognised, how do firms effectively integrate crowdsourcing activities into their existing NPD processes? This paper seeks answers for these questions.

■ Crowdsourcing-based Open Innovation

Definition

Crowdsourcing is defined as when a firm or institution takes a function typically performed by employees inside the firm/institution and outsources it to an undefined (and generally large) network of people outside the firm/institution in the form of an open call (HOWE, 2006). The acquisition of information from consumers for the purpose of product development is not a

new phenomenon: for many years manufacturers have asked end users for suggestions about new products and for advice on the development of existing models. They use salespeople to collect feedback from customers and this information is then used in product development processes. Also, marketing departments use focus group interviews (FGIs), customer visits, and pilot tests with limited numbers of potential customers as methods of collecting this data.

However, crowdsourcing contains the crucial characteristic of the scalability of Web 2.0 environments (KIM *et al.*, 2009). Firms can more quickly and more widely access the wisdom of the crowd on a global scale. This increases the opportunities to obtain the best or optimal solutions, so firms can create radically innovative products or transform their businesses (BONABEAU, 2009). In addition, there are several more benefits expected from the use of crowdsourcing and these are summarised in the following section.

Expected benefits

First, crowdsourcing is a way to overcome organisational biases or inertia. The knowledge and ideas obtained through external sources provide a variety of viewpoints to a firm whose employees may have similar or limited experience and knowledge leading to organisational biases and inertia (KRISTENSSON *et al.*, 2003). Therefore, the insights from the crowd can assist the firm in reducing the occurrence of narrow-minded and myopic decisions (ALAM, 2002).

Second, firms can obtain diverse ideas from the crowd. Senior managers working in product development at the largest manufacturer in Korea argue that the ideas from participants in FGIs do not significantly differ from those generated by employees. Nevertheless, the ideas collected from limited numbers of users are used to support the decisions made by employees of the firm. The scalability of online crowdsourcing enables firms to reach a greater variety of users who have differing degrees of knowledge and experience on a global scale.

Third, crowdsourcing is an effective marketing activity in itself because it is a method of communicating with customers and making customers feel valued. Customers who are aware of crowdsourcing activities conducted by a firm or who participate in the crowdsourcing activity are more likely to have a good impression of the innovative activities of the firm and they feel that

the firm respects their opinions and needs. This leads to customers' positive attitude toward the firm and, in turn, it enhances the customers' loyalty.

Fourth, crowdsourcing offers insights into the characteristics of early adopters and opportunities to present electronic word-of-mouth programs by leveraging the crowd. The crowd includes potential customers who are willing to purchase new products in the early stages of product diffusion after launching by firms. Crowdsourcing also increases customers' expectancies for the new product and the crowd can become advocates in the pre-commercialisation stages of a product under development (MALONE *et al.*, 2009).

Fifth, it is possible to gain unexpected breakthrough ideas and solutions based on the depth and breadth of the knowledge and experience of the crowd. Extraordinary ideas can be connected to innovative products that have not yet been introduced and they can disrupt existing alternatives in the market (BALDWIN *et al.*, 2006). Furthermore, firms can obtain ideas on disruptive innovation to complement their product portfolio. Experts and employees inside a firm have a tendency to suggest exploitative ideas that assist the incremental or sustainable development of existing products because they evaluate their own ideas within the limited bounds of the technological or business feasibility. In contrast, external people participating in a firm's crowdsourcing activity do not always know or consider the technical and business constraints, thus they are likely to share more radical ideas and thoughts that may appear ridiculous to internal employees and experts. Many disruptive innovations stem from these radical and creative ideas. Crowdsourcing is an important information source for disruptive ideas that can potentially substitute existing products or create new businesses in markets (POETZ & SCHREIER, 2012).

It is becoming increasingly important for firms to manage the dramatic changes in competitive markets by building a product portfolio that consists of a portion of "cash cow" products (currently lucrative businesses) and a portion of "question mark" products (emerging businesses in question). Because disruptive ideas can be easily overlooked by employees, it is recommended that internally-generated ideas be refined or evaluated through the crowd including customers, experts, and other potential stakeholders from third parties (MAGNUSSON, 2009).

Sixth, ideas about improving the service quality are another benefit from crowdsourcing. A firm's activities to improve its service quality after the initial purchase directly influence the firm's reputation in the market. Despite a

product being technologically superior, customers may easily change products to an alternative when they are dissatisfied with the customer care or after sales service offered by the firm. Using crowdsourcing as a communication channel to collect the voice of customers (VoC) (COOPER, 1990), a firm can obtain hidden information including complaints and negative feedback from dissatisfied customers.

These benefits render crowdsourcing an attractive method for firms to use open innovation as sources of ideas, business opportunities, and enhancing product platforms. Therefore, some leading manufacturers in the convergent media industry have attempted to extract the benefits of the crowdsourcing in their NPD processes. In the following section, the experiences of some leading firms are described by focusing on their primary motivation for the adoption of crowdsourcing, operation strategies, and the outcomes of the crowdsourcing activities.

■ Case studies

In this section, the recent crowdsourcing activities of some device manufacturers in the convergent media industry, including Apple, Samsung, Dell, Motorola, Sony, and Nokia, are illustrated. The primary motivations of adopting crowdsourcing are divided into three categories: collecting comprehensive ideas, seeking specific business opportunities, and enhancing application platforms.

Table 1 presents the overview of the cases which will be discussed in detail.

Table 1 - Crowdsourcing by manufacturers in convergent media industries

Case	Product	Crowdsourcing characteristics
Collecting comprehensive ideas		
Dell	Computers	<i>IdeaStorm (2007)</i> - Open to the public worldwide - Ideas evaluated and developed by the community and selected by in-house experts - No financial incentive or intellectual property rights guaranteed
Motorola	Mobile phones	<i>Motofwrld Scholarship (2006)</i> - Open to college students - Ideas evaluated by in-house experts - Financial incentive (\$10,000 scholarship) - Internship
Nokia	Mobile phones	<i>"Invent with Nokia" Program (2011)</i> - Open to the public - Ideas evaluated by in-house experts - Indirect financial incentive (offers patent management)
Seeking specific business opportunities		
IBM	Hardware, software	<i>InnovationJam (2006)</i> - Open to the public worldwide - Ideas evaluated by in-house experts - Financial incentive (funding)
SONY	Mobile phones, home appliances, computers	<i>Open Planet Ideas (2010)</i> - Open to the public worldwide - Ideas evaluated by experts from three collaborating firms - Supports realisation of the idea and intellectual property guaranteed
Enhancing application platforms		
Apple	Computers, Mobile phones	<i>Apple App Store (2007)</i> - Open to developers worldwide - Ideas screened by in-house experts and download counts determine popularity - Financial incentives (revenue sharing)
Samsung	Mobile phones, home appliances, computers	<i>Samsung Innovation Quest (SIQ)</i> <i>Samsung Apps Contest (2012)</i> - Open to developers worldwide - Ideas evaluated by end-users - Financial incentives (revenue sharing)

Collecting comprehensive ideas

In general, idea contests are a typical method of crowdsourcing for the purpose of collecting comprehensive ideas, and there are usually no restrictions on the qualifications of participants. Most firms that are willing to adopt crowdsourcing for this purpose expect to attain benefits such as potential users' awareness of the crowdsourcing activities and to source

useful ideas with minimal cost. Dell and Motorola are examples of manufacturers who use this category of crowdsourcing.

Dell: IdeaStorm

Dell's IdeaStorm is a website launched by Dell in February 2007 to allow Dell to identify which ideas are most important and most relevant to the public. Participants create an account on IdeaStorm and then they can post their ideas. Participants also have their own profile page that contains personal information and their site activities including ideas contributed, voted, and commented. The participants submit ideas by providing an idea title with an explanation and classification of the idea from over 30 categories (e.g. Linux, desktop, sales strategies, etc.). Participants only communicate via the idea's comment fields and direct communication with fellow users is not allowed. The ideas that are posted are reviewed by Dell's internal experts and executives. However, only a few of these ideas are considered for implementation. It has been reported that over 14,500 ideas with roughly 730,000 votes and almost 90,000 comments have been posted on IdeaStorm as of August 2010 (DI *et al.*, 2010); among these ideas, only 417 ideas (approximately 3% of all ideas submitted) have been implemented by Dell.

Interestingly, there is no financial compensation or incentives for posting ideas, and according to Dell IdeaStorm's Community Terms of Service, participants must agree to give Dell a royalty free license to use the idea without restrictions. Because the ideas are presented by users through voluntary participation, the ideas exhibit a low degree of elaboration and can be vague and immature. Furthermore, most ideas that are presented are often already known by the firm (BAYUS, 2012). Despite this limitation of the open call system, Dell has obtained several creative ideas that have been useful in the short and long term. For example, there was a suggestion of a computer that has multi-booting with a preinstalled Linux operating system. This idea produced thousands of votes and comments, and Dell launched three computers systems with Ubuntu 7.04 preinstalled on the computer a few months later.

In Dell's case, the crowdsourcing system works based on participants' voluntary activities without financial incentives, thus it has a low operation cost. Although there is no financial reward for participation, Dell has attempted to increase participants' intrinsic motivation in several ways. For example, top participants are honoured on the Top Idea Makers list that

identifies the 20 most influential users and contains information about their ideas and activities on the website. This social recognition by the firm and community assists in motivating participants to maintain their interest, offer new ideas, and continue to develop their ideas (DI *et al.*, 2010)

Motorola: Motofwrd Scholarship

Motorola's Motofwrd Scholarship is a crowdsourcing program for college students that collects ideas that describe the future of seamless mobility. The form of the ideas includes short stories (fiction), essay/white papers (nonfiction), short films (animated), comic strips, and digital arts. Participants should define the future of seamless mobility: a set of solutions that will provide easy, uninterrupted access to information, entertainment, communication, monitoring, and control, when, where, and how they want regardless of the device, service, network or location. The submission must contain information on how seamless mobility has the potential to enrich lives, foster inclusion, drive economic expansion, and impact broad segments of our society. The winner is given a \$10,000 Motorola scholarship, an eight-week apprenticeship at Motorola's Chief Technology Office, and a Bluetooth-enabled BMW.

Motorola's crowdsourcing activities are targeted at college-aged participants. Through the Motofwrd Scholarship, Motorola can gain the attention of young customers as well as useful ideas for their business. In particular, Motorola's approach differed to Dell's IdeaStorm in that it actively offered financial and extrinsic incentives to encourage greater participation and experts were also involved in the selection of the winner.

Seeking specific business opportunities

IBM, Nokia, and Sony have demonstrated that crowdsourcing is an effective method of seeking potential business opportunities based on their technologies. These cases imply that crowdsourcing facilitates the synergetic integration of both internal expertise and external creative ideas, thus increasing the possibility of market success for the commercialised outcomes.

IBM's InnovationJam

IBM started the InnovationJam in 2001, subscribing to the belief that public discussion of research ideas could solve problems faster than IBM's in-house researchers. In 2006, the firm invested more than \$100 million in ideas and created 10 new divisions during this time. Over 150,000 participants joined the program in 2006.

BJELLAND & WOOD (2008) summarized the processes of IBM's InnovationJam are as follows.

- (1) Goal identification: The goal is to more effectively brainstorm and develop ideas, and then to more quickly commercialise them.
- (2) Determination of categories and subjects for discussion: IBM establishes the scope of the technology innovations by providing sufficient information to trigger discussions and inspire new ideas.
- (3) Building a website: IBM provides data on the technologies and online spaces to discuss them.
- (4) Jam phase one: Participants brainstorm a vast number of ideas using the website forums and wikis. Phase one lasts for 72 hours.
- (5) Phase one review: Fifty senior executives and professionals meet at IBM Research Headquarters to review the ideas and develop a first-cut selection of "Big Ideas".
- (6) Jam phase two: Participants Jam to refine the "Big Ideas" that were selected from phase one.
- (7) Phase two review: A similar process to phase one review using e-clustering and human reviewers to identify the ideas that fit IBM's product portfolio and needs.
- (8) Proposing new business: New business units with a critical mass are selected for funding by IBM. For example, ten new business units were funded in 2006: smart healthcare payment systems, simplified business engines, real-time translation services, intelligent utility networks, 3D Internet, "Digital me" (similar to Apple's MobileMe which has been transferred to iCloud), branchless banking for the masses, integrated mass transit information system, electronic health record systems, and "Big green" innovations.

IBM adopted crowdsourcing in order to identify new market opportunities and create real solutions that advance business, communities, and society by exploiting the wisdom of the global crowd. The InnovationJam's goal is to move beyond simple invention and idea generation: IBM offered experts and professionals to refine and develop ideas and support the selected ideas for commercialization.

Nokia: Invent with Nokia

In May 2011, Nokia launched "Invent with Nokia", which is an online crowdsourcing platform that encourages the public to submit ideas for future devices and services that Nokia can develop. Nokia selects the promising ideas, supports the acquisition and management of the intellectual property rights for the selected ideas, and then pays for the patent idea of the contributor. The proposed ideas should be relevant to the area of mobile phones, mobile phone applications/services (e.g. for distribution in an applications store), wireless standards (cellular, WLAN, etc.), mobile device features (user interfaces, sensing applications etc.), mobile device concepts (mechanics, displays, cameras, etc.), and/or mobile software/operating systems.

Nokia actively seeks new business opportunities by harnessing the crowdsourcing platform. Internal experts are involved in the refining of the original ideas and the firm offers financial, legal, and R&D resources to develop the selected ideas for patents. The financial incentive in Nokia's initiative is evidence of the firm's strong belief in the power of the crowd.

Sony

Sony is currently losing their leading position in the electronics industry. In the mobile device market, Sony is lagging behind Nokia, Samsung, and Apple (WSJ, 2012). In May 2010, Sony introduced a crowdsourcing platform developed in conjunction with the World Wildlife Fund (WWF) and IDEO, a global design firm. The crowdsourcing platform is named Open Planet Ideas and is designed to collect ideas relevant to green IT, which contributes to environmental sustainability. Participants suggest ideas that use Sony's existing technologies ¹. The online crowdsourcing platform provides a virtual space for shared thinking, debate, and collaboration. The final winner is selected and the idea is realised through six phases: inspiration, conceptualisation, evaluation, top concepts, final concept, and realisation (OPENPLANETIDEAS, 2012).

¹ Participants must use at least one Sony technology as a building block for their inspiration. The technologies include wireless microphones, GPS, presence sensing, peer-to-peer software, sweep panorama (an advanced imaging technology), PSP@Go (portable mobile gaming device), remote video monitoring, dye-sensitized solar cells, and Felica (near-field IC system for mobile payments).

In the inspiration phase (4 weeks), participants post comments and add interesting stories, videos, photos, articles, sketches, and anything that might help the community think differently. Participants also applaud others' ideas and build upon each other's contributions. All posts are tagged to make them searchable. The expert panel convenes to help craft to improve the immature ideas. In the conceptualisation phase (9 weeks), Sony synthesises the inspirations into themes: the expert panel examines all inspirations contributed by the participants and synthesises them into themes. During this phase, Sony asks participants to reuse, combine, or mash-up Sony technologies with other technologies to imagine solutions to the challenge. In the evaluation phase, the community helps the expert panel review the 400 concepts to identify seven with the most potential. The expert panel² set criteria to evaluate the final seven concepts. The expert panel consider each idea's potential, the volume of applause received from the community, and the related comments from the community. They ask the community to evaluate the shortlisted concepts by answering the questions on originality, potential to create a significant environmental impact, and technological feasibility. In the final concept phase, with input from the community and background research, the expert panel decides on the final concept. Finally, in the realisation phase, alongside the final concept's author, Sony, and Sony's partners begin the collaborative process of realisation.

During the event in 2010, which lasted for 146 days, the online platform attracted over 400 concepts from 199 countries. Sony benefited from the platform because it not only found useful, eco-friendly business models based on Sony's proprietary technologies, but it also discovered a new way to engage with its consumers. This was the first time that the firm had shared intellectual property so openly with the public. Indeed, Sony reported that the understanding that consumers received through using an open forum was far deeper than it could ever achieve through traditional market research and customer surveys (OPENPLANETIDEAS, 2012).

Enhancing application platforms

Enhancing application platforms is one of the most urgent challenges facing manufacturers in the convergent media industry. As the business

² The expert panel consists of nine professionals: five technology experts from Sony, three environmental experts from WWF, and one design professional from IDEO.

borders of the value chain ³ in the media industry have been blurred due to vertical integration across the entire value chain, application and content platforms have emerged as a core competence among competitors. As differentiation of device specifications has become insufficient to meet users' compound needs for consumption of multimedia and applications, manufacturers have begun to use application platforms. Recently, device manufacturers have taken advantage of crowdsourcing in order to enhance their application platforms by adopting open source platforms, offering open APIs, and providing revenue sharing models with developers.

Apple

Apple's App Store is a digital application distribution platform for iOS developed and maintained by Apple. The App Store opened on July 10, 2008 via an update to iTunes. As of January 2013, there were at least 775,000 third party apps available on the App Store (APPLE, 2013). The service allows users to browse and download applications from the iTunes Store that were developed using the iOS SDK published through Apple.

Apple's App Store adds value to Apple devices by establishing a convenient environment for users to connect to numerous apps and content. Recently, Apple has enabled greater seamless transfers of user content through Apple's media devices including the iPhone, iPad, and PCs using cloud computing technology. The more people adopt Apple's devices, the larger the numbers of application developers register their apps in Apple's platform. The revenue sharing model for paid apps between Apple and a developer also motivates potential developers to use Apple's platform.

In summary, the integration and enhancement of application platforms and devices that are critical for Apple to build competency in the convergent media industry is central in Apple's crowdsourcing strategy, and now Apple's strategy is being imitated by their competitors.

³ A typical value chain in the digital media industry consists of content providers, platform providers, network operators, and device manufacturers.

***Samsung Electronics: Samsung Innovation Quest (SIQ)
and Samsung Global Developer Challenge***

SIQ is an open innovation competition that Samsung directed in 2006/2007 and 2007/2008 in order to source innovative ideas that could be realised in some of Samsung's advanced mobile phones. There were two categories of innovation topics: the professional section that was an open topic competition where a solution for any category in the mobile telecommunications industry could be submitted and the academic section that was a multi-topic competition where a solution in specific categories including location-based services, Web 2.0, and widgets in the mobile telecommunications industry could be submitted. All ideas submitted to SIQ were reviewed by industry experts for feasibility and synergy. Samsung IQ was abandoned in 2012, but Samsung continues to offer crowdsourcing activities through the Samsung Electronics Global Developer Challenge. In 2012, the contest offered \$4.08 million in cash prizes and mega marketing support for app promotion for the top 80 apps, which included 60 apps for GALAXY tablet and Note and 20 best apps featuring the most creative GALAXY Note Stylus Pen (S Pen) functions. The winner was selected by the number of downloads during a specific time period.

The ultimate aim of these crowdsourcing activities is to enhance the firm's application platform (Samsung Apps). Similar to Apple, Samsung allows their consumers to use applications throughout Samsung's product family including mobile devices, PCs, and TVs. Due to the relatively low market awareness of Samsung's platform and its lack of content, Samsung actively invests in the promotion of app contests and offers direct money compensation as well as revenue sharing with developers.

As shown in the above business cases, leading technology firms have various approaches to crowdsourcing in terms of their primary purpose, method of screening ideas, type of participants, and incentive policies. Furthermore, an optimal type of crowdsourcing has not been empirically reported from the industry, and the definition and measurements of the effectiveness of crowdsourcing are not standardised across the industry.

Although successful crowdsourcing depends on the differing situations that firms face, it is possible to discuss general guidelines for crowdsourcing that are applicable to the device manufacturers.

■ Guidelines for practices

Based on prior studies on new product development (NPD), open innovation, business case studies of crowdsourcing, and in-depth interviews with senior managers in global manufacturers operating in Korea, the significant differences between the conventional NPD and the crowdsourcing-integrated NPD processes are summarised in table 2.

Table 2 - Comparison between the conventional and crowdsourcing-integrated NPD processes

	<i>Conventional NPD</i>	<i>Crowdsourcing-integrated NPD</i>	<i>Relative benefits of crowdsourcing-integrated NPD</i>
<i>Type of innovation pursued</i>	More suited to developing incremental innovations	More appropriate for locating ideas for radical innovations	Helpful in building longer term plans
<i>Product portfolio</i>	Maintaining a conservative portfolio	Rebuilding the product portfolio with disruptive products	Managing emerging market opportunities
<i>Main participants</i>	Internal employees and/or experts	End users and/or external professionals	Understanding and managing consumers' hidden desires
<i>Participant constraints</i>	Locally limited	Global scale	Collecting a variety of ideas reflecting regional and cultural variations and factors
<i>Primary criteria for idea evaluation</i>	Technological and business feasibility	Novelty, customer values, technological feasibility, and business feasibility	Overcoming potentially biased idea generation among internal employees
<i>Decision makers</i>	Predominantly by internal experts or executives	Solely end users or a panel of internal and external experts	Overcoming potentially biased thinking of internal employees; fast feedback from potential customers
<i>Reward system</i>	Extrinsic incentives	Extrinsic and/or intrinsic incentives	Cost for extrinsic incentives can be reduced by facilitating participants' intrinsic motivation such as fun or sense of duty or privilege

Furthermore, a set of manufacturer guidelines for the convergent media industry regarding the implementation and integration of crowdsourcing activities into their NPD processes are proposed here.

First, a framework of measurement indices that will be used to evaluate the effectiveness of a firm's crowdsourcing activity should be determined. There are some standard indicators that are well known and frequently used to measure the quality of ideas, including the originality or novelty of the idea, the technological and business feasibility of the idea, and the customer

values offered by the idea (MAGNUSSON, 2009; POETZ & SCHREIER, 2012). The crowdsourcing-integrated NPD provides greater opportunities to uncover novel ideas related to the expected customer values, but the ideas often lack technological and business feasibility. Thus, crowdsourcing is more appropriate for seeking long-term business opportunities compared with ideas that are viable in the short-term. Moreover, in the interviews, the industry experts suggested that general users provide relatively novel ideas that reflect their hidden needs, desires, and dissatisfactions, but the ideas do not consider aspects of technological feasibility in depth. Therefore, it might be sufficient to use the conventional NPD for incremental innovation if a firm pursues short-term business success. Meanwhile, it is recommended that crowdsourcing-integrated NPD is implemented for locating long-term business ideas or ideas for radical innovation. For example, in the case of Sony's Open Planet Ideas, the top priorities for the suggested ideas were technological feasibility, potential market size, and environmental impact. If Sony focused on only the feasibility aspect of an idea, the business opportunities using their technologies for sustainable environmental development could be easily ignored.

Second, the scope of the NPD process that will adopt a crowdsourcing method and the type of participants should be determined. The typical stages of the new product development process are as follows: strategy planning → idea generation → idea screening → business analysis → formation of cross-functional team → development → pilot run and testing/test marketing → commercialisation (ALAM, 2002). Internal employees undertake most conventional NPD processes and consumer involvement is rarely exploited in specific stages such as pilot tests. However, crowdsourcing opens the NPD processes to the public including end users and experts, and it leverages the collective intelligence of the participants for better decision-making in each stage through mixed use of different types of participants.

Decisions on including different types of participants relies on the extent to which the firm expects the depth and breadth of knowledge of the participants or the experience of the participants or the extent to which the firm is concerned about the potential intervention of organisational bias in each NPD stage. In order to collect comprehensive ideas or increase market awareness of a firm's innovative activity, collecting ideas from the public only is a viable option. However, if a firm strategically uses crowdsourcing for finding specific business opportunities, it must refine the sourced ideas using experts from internal and/or external sources. For example, IBM allowed senior executives to participate in screening ideas and Sony also used an

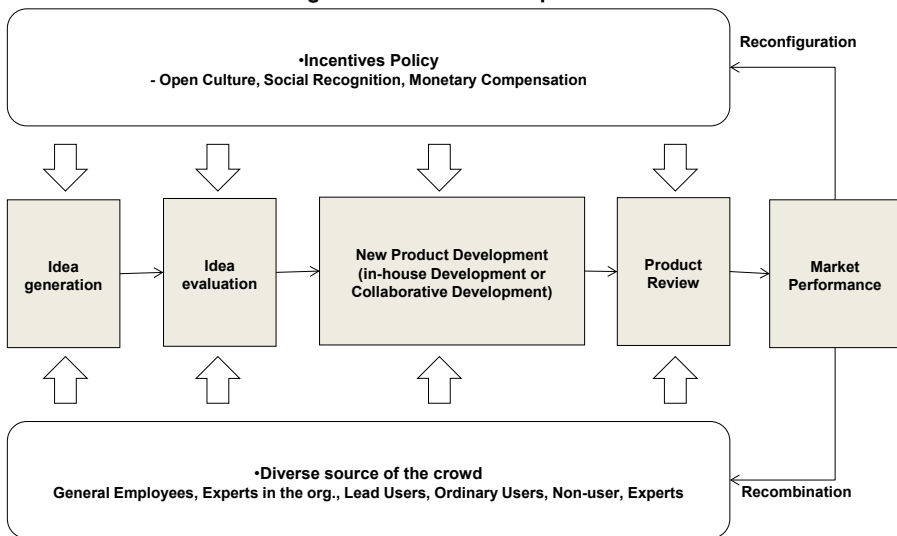
expert panel that consisted of experts with different professional backgrounds. In this research, the interviewees also demonstrated their interest in user-based crowdsourcing for idea generation, testing, and piloting new products or services.

Third, policies on intrinsic and/or extrinsic incentives for participant contributions should be designed. Crowdsourcing participants can be motivated intrinsically to contribute to crowdsourcing activities when they are interested in or enjoy the task itself. This is distinguished from the conventional NPD that primarily focuses on the design of extrinsic incentives for facilitating employees' participation. For example, contributors to open source software are regarded as highly intrinsically motivated people. For this type of crowd, it is effective to offer challenging problems that participants consider valuable to solve. Extrinsic incentives include direct financial or tangible rewards or social recognition. Generally, participants inside a firm are motivated by extrinsic incentives such as financial compensation and recognition by top managers and colleagues (ZHENG *et al.*, 2011). As observed in the cases outlined above, most firms offer extrinsic incentives. For example, Nokia and Sony patent selected ideas and share the patent rights with original contributor; Motorola and IBM give cash directly to the contributor of the winning idea; Apple and Samsung share revenue with developers. Although Dell does not provide financial rewards to its contributors, the firm selects distinguished contributors and posts their name and activities to increase social recognition among other participants and experts. It should be noted that there is a trend for firms to offer more extrinsic incentives that assist in developing on-going relationships with contributors rather than only providing a tentative connection through financial rewards only.

Fourth, if the firms intend to realise the suggested ideas, they need to take further actions for commercialisation of the selected ideas (COOPER, 1990; JOLLY, 1997). While the conventional NPD has depended heavily on in-house development of new products using internal resources in a closed system, crowdsourcing-integrated NPD encourages the involvement of the original contributors and open collaboration with other external institutes or experts at each stage of commercialisation. For example, Nokia actively leverages the public as a new source of intellectual property through collecting ideas from individuals or external professionals and selecting ideas that create synergies with their own technologies and patents. Furthermore, internal experts on technologies and intellectual property can contribute in the review of ideas and assist with the decision to include the ideas in the firm's patent portfolio, as in the case of Sony hosting several

offline meetings and opening the online forum for further development of the winning idea. In the commercialisation stage, Sony and its external partners provided an opportunity for the original contributor to lead or coordinate the project. Also, Motorola provided an internship opportunity for the winner of the idea contest so that they could experience the real process of technology commercialisation and also to improve the original idea throughout the commercialisation process.

Figure 1 - Guidelines for practice



Finally, the results of the crowdsourcing activity should be continuously monitored and evaluated according to the criteria that were determined in the initial stage. The effectiveness of the crowdsourcing activity will differ according to the various combinations and applicable scope of the NPD, type of participant, and incentive policies. In conclusion, a conceptual framework that demonstrates the integration of the crowdsourcing activity into a firm's new product development process is presented in figure 1. This figure depicts the underlying processes of product innovation: from idea generation to market performance. Crowdsourcing activities can be applied at each stage with different types of crowd and different incentive policies. The effectiveness of crowdsourcing activities can be measured by market performance, e.g. innovative product sales. According to the performance, firms can reconfigure their incentive policies or recombine the different types of crowd in order to optimise their crowdsourcing activities and to source more exceptional ideas.

■ Conclusions

Crowdsourcing approaches are useful methods for product innovation for device manufacturers in high-tech industries where the not-invented-here syndrome prevails. Despite endeavours to comprehensively understand the effect of crowdsourcing in convergence device industry, this study has some limitations in terms of research methodology and generalisability.

The suggestions in this paper rely on a limited number of exemplars because internet-enabled crowdsourcing is an emerging phenomenon for open innovation and has been adopted and executed by only a few firms, most of which are leaders in their industry. Therefore, a more specific method for combining incentive policies and crowd types cannot be provided at this point. Also, experts from leading Korean device manufacturers were interviewed and their opinions were used to draw the expected benefits and practical guidelines. However, these opinions from a limited number of experts are difficult to generalise. Therefore, in order to obtain more generalisable results, further studies should be undertaken using a larger set of interviewees for statistically verifiable analyses.

In order to extend understanding of the effect of crowdsourcing as a creative open innovation tool, the following issues should be investigated further. The most important issues include measuring the effectiveness of crowdsourcing activities in terms of tangible and intangible impacts including cost reduction, productivity in idea generation, market performance, creative organisational culture, and organisational learning. Another issue for further investigation is the effect of crowdsourcing on overcoming organisational biases or inertia. Organisational biases may cause two types of error at the idea screening stage: kill errors (stop a good idea) and go errors (select a wrong idea) (COOPER & KLEINSCHMIDT, 1993). The collective intelligence of crowdsourcing is expected to counter these potential mistakes, thus leading to ideas and products that consumers are likely to adopt. Empirical studies and experiments that challenge this hypothesis are needed in order to gain greater understandings of these mechanisms. Finally, the development of effective incentive policies should also be investigated. Several issues are incorporated within the broader issue and these include the effectiveness of financial incentives or social recognition, organisational support, and mixed use of different types of incentives.

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