Original article

Value of crowdsourcing in the development process of product innovations

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INFORMATIONS	ABSTRACT
	The article is a theoretical consideration of the possibilities of using crowdsourcing in the development process of product innovations. In the first part of the article the essence of crowdsourcing is shown through the prism of selected elements of the definition. The next part of the article presents the concept of using crowdsourcing at individual stages of the product innovation development process and the wisdom of the crowd as a factor creating value in the discussed process.

Introduction

Internet communities have been studied for over a decade as a source of ideas and inspiration for new product development. R. Kozinets in his numerous studies conducted on these communities points out that between 10 and 40 percent of consumers say that they are involved in the development and modification of products from different areas [Kozinets et al. 2008]. Nevertheless, only recently with the advent of new technological forms of creative cooperation such as Wikipedia and cooperation models such as Open Source, consumers have been recognized as a full-fledged collective creative force having an impact on the development of new products. The role of a consumer has also changed from the passive position of a buyer to a co-creator of the value desired in the process of developing product innovations.

Inclusion of a consumer in the process of developing product innovations is associated by many researchers in this area with the hope of improving the efficiency of the implementation of innovative products on the market. This means, among other things, lowering the costs of implementing the discussed process as well as increasing the acceptance of innovative products among potential buyers.

Crowdsourcing, which mainly derives from the resources of knowledge and experience of online communities and indicates the possibilities and tools for realizing this potential, is one of the concepts that can improve the situation described above.

The aim of the article is to present the possibilities offered by crowdsourcing and the values provided by "the wisdom of the crowd" in the process of developing product innovations

1. The essence and the meaning of crowdsourcing

Crowdsourcing is not a new phenomenon. In the past, various problems were solved by involving large groups of participants acquired from a wide crowd. In the 18th century, the British government commissioned an open question to solve the problem of determining the longitude of the ship's position at sea. The need to solve the problem was so great that the British government set up a parliamentary Committee on Longitude and suggested a system of incentive rewards for everyone who would help in solving the task. For over 100 years of the Act's implementation, countless proposals for solving the problem were submitted. They came from people of various specialties, different social and property status. Solutions helped to improve navigational instruments and improve the quality of maps being developed [Crowd Around… (n.d.)].

The importance of crowdsourcing has increased significantly in the last decade mainly due to the intensive development of technologies and communication tools used in the online environment. Currently crowdsourcing is used by many well-known companies and is used to engage large groups of online communities in the implementation of tasks that vary in form and difficulty.

In the literature on the subject, there are many definitions of crowdsourcing and it is worth recalling a few of them to look more closely at the phenomenon discussed. J. Howe developed one of the key definitions. According to the author, crowdsourcing is the operation of an enterprise or institution consisting in selecting an activity previously performed by its own employees and commissioning its performance to an undefined (generally large) group of people in the form of an open inquiry [Howe 2006]. In his definition, V.M. Ribiere draws attention to the environment in which crowdsourcing works best as well as which activities it concerns. Crowdsourcing consists in the online publication of an open question about a creative idea, solving a problem, making an assessment and allowing each person of the crowd to present a solution [Ribiere and Tuggle 2010].

Choosing the right **crowd** is one of the key tasks undertaken in the crowdsourcing concept. According to J. Howe, knowledge management and other resources acquired from the crowd require intelligent, well-chosen and trained crowd of users [Howe 2006]. In connection with the above, in the literature of the subject references to the need to describe the number and typology of crowd participants can be found. In the case of the number of people, most authors point to an indefinite and large group of people who do not necessarily know each other. The participants' knowledge necessary to complete the task may be a limitation for the size of the crowd. Due to the

above, the heterogeneity and size of the crowd increases in the case of simple tasks and decreases with the degree of desired specialization. In the case of typology, the authors identify the crowd as users or consumers, amateurs as well as specialists in specific fields. The crowd can also be characterized because of the strength of social ties between participants and the degree of involvement in the task that is the basis of a specific group's activity [Kozinets 1999]:

- "Tourist" does not create strong ties with the group as well as is usually poorly interested in the task carried out by a group,
- "Mingler" maintains strong social ties but is poorly involved in the implementation of the commissioned task,
- "Devotee" is usually strongly involved in the matter but does not create too strong and lasting ties with the community,
- "Insider" is strongly involved in building relationships with other participants in the community as well as in the implementation of the assigned task, matter.

In his works, Kozinets indicates that the most active, engaged user segments are represented primarily by representatives from the "Devotee" and "Insider" groups.

Another approach to the typology of crowd participants is the application of the "leading user" theory according to Von Hippel. The author believed that in every society there are people who are able to stay ahead of market needs and create market trends. The lack of satisfaction from existing and available solutions on the market constitutes the motivation to act for the leading users [Hippel 1986]. Important features distinguishing the leading users include [Westerlund et al. 2013]:

- high level of specialist knowledge,
- ability to predict future trends,
- the need to belong to a chosen community and to build relationships with participants.

The scope of work commissioned for execution is closely related to the concept of crowd in the context of crowdsourcing. Researchers basically indicate that the crowd undertakes and performs a task of varying degrees of difficulty or also solves a problem identified by the company. Due to the above, the task may be of a regenerative nature, often even routine, however, it can also be complicated and require creative thinking from a contractor. In this way, solutions are often created in which uniqueness and authenticity is a basic value that is especially appreciated in the development of innovations. Regardless of the complexity of the problem, it is a necessary condition to precisely formulate the tasks by the ordering party and properly communicate them in the direction of the crowd previously selected.

According to the concept of crowdsourcing, tasks or solutions provided by crowd participants should be subject to **compensation**. There is no unanimity among the researchers as regards the form of the proposed payment. Some point to monetary compensation for the solution adopted, others including G. Kazai [2011] speaks about social recognition and entertainment value as a form of payment. The conducted research on real motivations to take up action indicate: cash prizes, opportunities to de-

velop creative skills, play, sharing knowledge, opportunities for independent work, strengthening social bonds. The type of compensation is related to the typology of the crowd and usually satisfies one or more individual needs of participants.

In the context of the crowdsourcing definitions presented above, it is worth looking at the concept of **open inquiry**. It is a form of inviting crowd participants to accomplish a task or solve a problem. An open inquiry can be directed to:

- – potential participants with no restrictions as to the size and characteristics of the crowd,
- – a selected community having the required expertise and experience,
- – an open, heterogeneous group controlled by the creator of the inquiry.

The essence of an open inquiry is the act of reaching out of an enterprise to crowd participants and asking for participation. Therefore, it is not self-organizing of Internet communities around a specific matter that occurs, for example, as it is the case of the Open Source model.

When characterizing the phenomenon of crowdsourcing, one should also pay attention to the important role of the Internet as a medium. It enabled massive, direct, dynamic, two-way communication realized in a very short time at a huge distance. Owing to this, participants of the crowd gained a real opportunity to participate in solving problems and delivering ideas.

Collective intelligence is the key value of crowdsourcing presented in the literature as "the wisdom of the crowd". J. Surowiecki states that "in the right circumstances, groups are extremely intelligent and frequently even more intelligent than the smartest individuals in them" [Brabham 2008] The joint creativity of crowd participants is qualitatively different from an individual consumer's creativity [Kozinets et al. 2008]. Situations involving collective creativity of users are triggered by related activities: search assistance, mutual correction and mutual reinforcement [Kozinets et al. 2008].

2. Utilization of crowdsourcing
in the development process of product innovations

Literature in the field of innovation management is rich in research combining customers with successful innovations in the field of products and services. The authors suggest that users constitute a significant innovation potential since their competences and experience not only support the stage of creating ideas, but also may contribute to innovation throughout the development process. Thanks to users' (consumers) innovations, enterprises more efficiently and quickly discover new ideas and implement innovative products on the market. This is because the knowledge acquired by consumers during the actual use of products makes them an indispensable external source of new products.

The use of the crowdsourcing concept is seen as an opportunity to involve participants in the process of product innovation development and might be at least a partial solu-

tion for a constantly too low number of innovative products that are successful on the market [Fuller et al. 2006].

Three key steps can be distinguished and characterized in the product innovation development process:
- the stage of initial development: characterized by the search and identification of new ideas, verification and initial assessment of generated concepts, an analysis of the market and manufacturing capabilities,
- the product development stage: development and verification of technological capabilities, preparation of a product prototype, realization of market tests, development and testing of activities related to the marketing of the product,
- the product launch: realization of a previously prepared strategy for implementing product innovation on the market, a consumer opinion survey, implementation of possible changes or redesign of a product based on information gathered from the market.

The first stage in the process of developing product innovations is **searching for and evaluating ideas**. For a longer period, innovative companies focused on stimulating creativity among employees and developing specialized departments as internal sources of ideas and concepts for innovative products. Among the researchers in the field of innovation, the views prevailed that internal sources of innovation are more effective than the knowledge and experience of users. The competences of specialists working in a given company as more promising in creating new products as opposed to the intuitive consumer approach were identified [Poetz and Schreier 2012]. There were claims that really creative ideas for new products are very often beyond the scope of consumer experience [Cooper 1999]. Users may be too accustomed to current consumption conditions, which prevents them from forecasting and shaping the future [Poetz and Schreier 2012]. In view of the above, according to some researchers, relying on the method of acquiring ideas from users may limit a company in creating important breakthrough innovations [Poetz and Schreier 2012].

The significant success of Open Source software significantly influenced the perception of the role of users in the process of developing product innovations. Various companies recognized on the market began to experiment with the concept of using the creative potential of users in creating new products. A number of empirical studies on the sources of innovation in the field of industrial and consumer products have proved that it is first and foremost users who are the main creators of new products, which are later accepted by the market. The users of these products have long been the source of the most important innovations in snowboarding and windsurfing [Poetz and Schreier 2012]. In addition, empirical studies have shown that over 30% of the surveyed population reported their share in creating product innovations available on the market [Hippel 2005].

When using crowdsourcing at the stage of searching for and creating ideas, special attention should be paid to the following elements:
- proper selection of crowd participants (typology and size),

– ways and possibilities of searching for identified crowd participants,
– selection of tools for collecting and processing information obtained from the crowd.

The selection of an appropriate group of participants, both in terms of size and typology, is of key importance at the indicated stage of product innovation development. The ability of users to create promising ideas for new products depends, among other things, on the industry, product categories as well as on the nature of a specific problem related to innovation. If the knowledge needed to generate new ideas for products in a given industry category is complex and expensive to obtain, users may be less inclined to engage and develop their own ideas. If the barriers to accessing knowledge are low and the knowledge needed to develop successful ideas is closely related to aspects of the use of experience, users could be more effective in seeking ideas [Hippel 2005].

In the case of more complex tasks at the stage of searching for ideas, the group of leading users described earlier may be utilized. The above-mentioned status of a leading user can be enriched with the in-depth characterization of personality traits desired in the process of creating ideas: innovation, creativity, specialist knowledge and communication skills. Identification and search for leading users in the online community can be done by observing their activity during competition in online contests or on virtual stock markets of ideas [Fuller et al. 2006]. In addition, leading users can be characterized using demographic, psychographic and behavioral criteria for this purpose and then the profiles created are matched to existing and recognizable segments of buyers. Due to these activities, it is possible to expand a potential group of crowd participants at subsequent stages of the development process and especially at the stage of implementing innovative products on the market.

Finding ways to look for the crowd participants described and selected earlier is an equally important condition determining the proper use of crowdsourcing in the process of creating ideas. To this end, one can use, among others:
– existing online communities associated or cooperating with a given company,
– relationships developed by the company employees with various customer, supplier and subcontractor environments that may lead to the identification of larger groups and communities,
– forums, discussion groups, clubs and portals as places of meetings of the Internet communities whose characteristics may correspond to the tasks set.

The development and preparation of appropriate tools for acquiring and collecting information is another important condition for obtaining appropriate and desirable resources in the form of ideas and new concepts from the crowd. In this case, two key aspects: the way of communication and adaptation of technology to the needs and capabilities of users should be taken into account. In the case of communication rules, attention should be paid to the existing norms and values in the Internet communication with a specific group as well as the form of communication itself, in particular the language used. In the case of the Internet tools, which include, among others, plat-

forms and websites, the main condition for their creation is transparency, ease of application and intuitiveness.

The examples of two companies using crowdsourcing in the process of product innovation development: Threadless.com [Brabham 2008] and Audi [Fuller et al. 2006] can be used to illustrate how to use the above principles.

Threadless.com is an online company offering printed T-shirts. It makes use of crowdsourcing as a process of continuous acquiring new print projects from users who participate in competitions organized by the company. All Internet users may be crowd participants as long as they have an email address. The tasks set by the company consist in sending designs for printing on T-shirts and the evaluation of exhibited projects by crowd participants. For this purpose, those taking part in the competition can obtain tools from the Thredless.com website in the form of Adobe Flash and Adobe Photoshop as well as instructions describing expectations regarding the quality of workmanship and the colors of the projects submitted.

The example of Audi focuses on the development of the Infotainment audio system using the crowdsourcing concept. The main assumptions of the project described below concerned the use of crowdsourcing techniques to:

- acquiring knowledge about the consumer (needs, preferences) and upcoming trends quickly and at low costs,
- inclusion of the consumer through the use of online tools in the process of innovation development in order to increase the chances of accepting a new product among future customers.

Three main groups of participants were identified at the stage of collecting ideas and concepts for an innovative solution:

- **Super Innovators** whose task was to anticipate future trends and generate very creative solutions; the members of the group were primarily key users of technological products.
- **Early followers**, whose tasks included looking for ideas to improve existing solutions within operating systems.
- **Typical users** were asked to assess the weaknesses of available solutions and submit suggestions for changes.

It should be noted that according to the idea of crowdsourcing, individual groups of participants were assigned precisely defined tasks corresponding to the competences and characteristics of the indicated groups. In order to find the participants described above, the following tools were used: the company website as well as well-known Internet forums and discussion groups. For the purposes of collecting ideas sent by participants, a dedicated platform, Virtual Laboratory, was developed. Adobe Flesh was made available as a tool to present the idea for the members of the groups described above.

In the **product design and development phase**, ideas collected from users are transformed into a concept and then into a product prototype. As the literature on the sub-

ject points out, project teams in many companies implementing product innovations work too long at this stage and too rarely test solutions created among users. The primacy of design and engineering knowledge often prevails over the purposefulness of implementing product innovation, including acceptance among potential buyers. In order to limit the duration of this stage and to increase the chances of developing a product that meets the expectations of users, many researchers postulate making users co-authors or co-contractors in the product development process.

The inclusion of users in the process of product innovation development is proposed, in the works of, among others, R. Cooper. During many years of research on the process of product innovation development, the author noted that project teams should work more efficiently and need up-to-date, valuable information obtained from the market. The sequence "build, test, apply the collected information, then redo the previous action" described as the Spiral of Development sets the following actions [Cooper 2014]:

- process the idea into even the simplest form of the product that the user can see and evaluate,
- test the developed solution among users, evaluate their interest, preferences and purchase intentions, collect feedback,
- process dynamically the information collected from users into proposals of changes and improvements,
- after making changes, test again until the final version of the product is obtained.

The theory of the Spiral of Development indicates the need for dynamic action within the design and interaction with the user. Each subsequent modification should strengthen the resulting solution and, consequently, lead to the development of a product expected by the user. The difference between the described approach and the conventional market research relates to the fact that users are not only asked about their opinions and needs but are also encouraged to solve problems and actively co-create a new product.

The stage of product design and evaluation based on the Spiral of Development requires the participants to be in constant contact with the company. Therefore, a company reporting the demand for crowd participation in the design and testing of solutions should make available modern tools and communication channels. The Internet as a medium through which crowd participants can carry out their tasks is very helpful in this respect. Virtual platforms that create a friendly environment for work for crowd participants are the most common among the IT tools used at the described stage. Repeatedly, they offer functionality that enables joint work and effective verification of the ideas created. Social media play an important role of communication channels. They create a friendly working environment for selected crowd participants.

The composition of the group at the stage of product development depends on the complexity of the problem and motivation of the participants. For products requiring specialist knowledge, the groups of participants identified as leading users will have

greater use. Especially taking into consideration the distinguishing features such as: specialist expertise in a specific area, excellent knowledge of technological solutions and creativity in finding solutions can be a significant support for the project team. At the same time, while introducing further improvements on the Spiral of Development, the test group may be expanded by potential buyers in the previously identified segments.

In the case of Thradless.com, the projects developed by the participants were presented on the Thradless.com platform where the remaining crowd participants evaluated them. The rating was on the scale of 0 to 5, there was also the possibility to mark the "I'd like to buy" option. Among the projects the most highly rated by crowd participants, the company's employees chose products for sale in the online store. Designers whose work won and were intended for sale received a gratuity in the form of a salary and a voucher for purchase in the online store Thredless.com. In the example of Audi, at the stage of product design and development, the ideas submitted were converted into prototypes in the Virtual Laboratory. Before the next third phase of product development, the group of participants was expanded to include buyers from selected segments of the Audi product market.

The **phase of introducing innovations to the market** is connected with the necessity to maintain constant contact with the user in order to order to obtain his/her views and introduce possible modifications within the product or other marketing tools. The application of classical research methods is possible for this purpose, however it is connected with the extension of the time of collecting and processing the information acquired. It seems more justified in the era of intensive technological development to use tools and communication channels that will enable efficient and dynamic information exchange. With regard to crowdsourcing, this function can be fulfilled by Social Media, which offers the opportunity to acquire knowledge from online communities, but also to exchange knowledge between the participants themselves. It increases the collective intelligence.

Thredless.com, at the marketing stage of its new products, for promotional purposes used crowd participants who did not take part in the design process. It announced a contest among product users for the best photos taken on the street in Thredless T-shirts. Participants delivering photos gathered points that they could exchange for t-shirts in the future. The described activities increased the interest in the product and intensified sales in the company's online store.

In the assessment of the activities carried out using crowdsourcing, Thredless.com emphasized that the costs incurred to recruit participants, organize competitions and prizes for the best projects were significantly low. Due to the actions taken, the company guided by the expectations of buyers was able to release interesting products on the market in a short time and at attractive prices. Other companies using the crowdsourcing concept expressed similar opinions. They pointed out that the value that arose as a result of including crowd participants in the process of developing product innovations was a new dimension of cooperation based on the exchange of knowledge of openness and the involvement of the parties.

In the above context one can point to one more important aspect related to the product's life cycle. In the traditional approach, the following stages of the product life cycle are distinguished: product development, market introduction, sales growth, maturity and saturation, drop in product sales. The introduction of product innovations at the fourth stage (maturity and saturation) can significantly extend product life expectancy as well as increase the value of the product for a consumer. While emphasizing the importance of the innovation development process for the product life extension, it should be noted that the use of the wisdom of the crowd and the inclusion of consumers in the product development process provides new opportunities for drawing inspiration and rapid testing of new ideas.

Conclusions

The presented exemplification indicates that crowdsourcing provides opportunities to use the knowledge and other resources dispersed in the crowd at a relatively low cost, in a much shorter time due to the developed technology, and consequently can have a significant impact on the effectiveness of product innovation implementation on the market. In addition, active involvement of crowd participants in the process of co-creation of new products may have a positive impact on the level of product acceptance at the marketing stage. Expanding the impact of the crowd through the use at various stages of social media process can reduce the costs of promotional activities and shorten the time of launching the product on the market.

The above-described values generated by crowdsourcing in the process of developing product innovations appear to be very attractive for an enterprise. However, their very achievement is strongly associated with the organization and the degree of preparation of the company to use the concept presented. The implementation of crowdsourcing into the process of product innovation development requires the company to:

- development of appropriate tools enabling active participation of users in the process of product innovation development at every stage,
- development of procedures for involving participants of individual groups to the discussed process,
- appointment of persons on the side of the organization responsible for contacts and communication with crowd participants,
- openness and understanding for the implementation of the discussed activities by all members of the organization.

In connection with the foregoing, a company using crowdsourcing in the process of product innovation development should have access to modern technologies to have efficient cooperation procedures and a friendly external organization's culture.

It should also be noted that notwithstanding all these advantages, crowdsourcing also has limitations. An improperly selected crowd may disrupt the development process of a new product. Through excessive and uncontrolled openness an enterprise may lose relevant information. An improperly implemented communication process can lead to escalation of unpredictable behaviors on the side of the crowd.

There is a clear need to investigate the phenomenon of crowdsourcing in the context of using its advantages in the process of developing new products and reducing the defects associated with over-activity and a lack of control over the crowd involved in the cooperation.

Conflict of interests

The author declared no conflict of interests.

Author contributions

Author contributed to the interpretation of results and writing of the paper. Author read and approved the final manuscript.

Ethical statement

The research complies with all national and international ethical requirements.

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Biographical notes

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