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CROWDSOURCING INNOVATION INTERMEDIARIES FUNCTIONS

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Abstract

Open innovation is a hot topic in innovation management. Its basic premise is open up the innovation process. The innovation process, in general sense, may be seen as the process of designing, developing and commercializing a novel product or service to improve the value added of a company. The development of Web 2.0 tools facilitates this kind of contributions, opening space to the emergence of crowdsourcing innovation initiatives. Crowdsourcing is a form of outsourcing not directed to other companies but to the crowd by means of an open call mostly through an Internet platform.

Innovation intermediaries, in general sense, are organizations that work to enable innovation, that just act as brokers or agents between two or more parties. Usually, they are also engaged in other activities like inter-organizational networking and technology development and related activities. A crowdsourcing innovation intermediary is an organization that mediates the communication and relationship between the seekers – companies that aspire to solve some problem or to take advantage of any business opportunity – with a crowd that is prone to give ideas based on their knowledge, experience and wisdom.

This paper identifies and analyses the functions to be performed by an intermediary of crowdsourcing innovation through grounded theory analyses from literature. The resulting model is presented and explained.

The resulting model summarizes eight main functions that can be performed by a crowdsourcing process, namely, diagnoses, mediation, linking knowledge, community, evaluation, project management, intellectual property governance and marketing and support. These functions are associated with a learning cycle process which covers all the crowdsourcing activities that can be realized by the broker.

Keywords: Crowdsourcing Innovation, Intermediary Functions, Open Innovation, Innovation intermediation.

1 INTRODUCTION

Innovation is recognized by academics and practitioners as an essential competitive enabler for any company to survive, to remain competitive and to grow (Chesbrough, 2006; Lee, Park, Yoon, & Park, 2010; Tidd, 2001; von Hippel & von Krogh, 2003).

Investments in tasks of R&D have not always brought the expected results. But that doesn´t mean that the outcomes would not be useful to other companies of the same business area or even from another area. Thus, there is much knowledge already available in the market that can be helpful to some and profitable to others. So, the ideas and expertise can be found outside a company's boundaries and also exported from within. The selling of internal ideas and technologies can create significant value for the company. This new approach to innovation is called open innovation (Chesbrough, 2003).

Open innovation is a timely topic in innovation management. Its basic premise is open up the innovation process. The innovation process, in general sense, may be seen as the process of designing, developing and commercializing a novel product or service to improve the value added of a company.

This paradigm proposes the use of external and internal ideas, and internal and external paths to market, as means to reach advances in technology used by companies (Chesbrough, 2006).

The World Wide Web, the open source movement and the development of Web 2.0 tools facilitates this kind of contributions, opening space to the emergence of crowdsourcing innovation initiatives.

Jeff Howe and Mark Robinson introduced the term crowdsourcing, in an article in Wired Magazine (Howe, 2006), as a way of using the Web 2.0 tools to generate new ideas through the heterogeneous knowledge available in the global network of individuals highly qualified and with easy access to information and technology. Although, this concept has been used quite a time, the creation of the Wikipedia and of many examples of free software, like Linux, are examples of crowdsourcing activity. Crowdsourcing is a form of outsourcing not directed to other companies but to the crowd by means of an open call mostly through an Internet platform. Basically, the process is trying to solve a company problem by an open call in the network. The company posts a problem and a vast amount of individuals offers the solution for evaluation. The winning idea is awarded in some way and the company develops the idea. The crowd can be defined as a large set of anonymous and heterogeneous individuals, which may be composed of scientists and experts in various fields, but also of novices (Howe, 2008; Surowiecki, 2005).

A crowdsourcing innovation intermediary is an organization that mediates the communication and relationship between the seekers – companies that aspire to solve some problem or to take advantage of any business opportunity – with a crowd that is prone to give ideas based on their knowledge, experience and wisdom (Ramos, Cardoso, Carvalho, & Graça, 2009).

For crowdsourcing innovation intermediary the crowd is composed by groups of specialists in different areas, such as individual researchers, research team, labs, post-graduate students and highly qualified individuals.

It have been appearing some crowdsourcing innovation brokers, like Innocentive, Nine Sigma, IdeaConnection, Yet2.com, some focus their business model in community development, others in brokering and others on technology transfer. Besides that, these brokers are somehow focus on a specific business area related with the market they usually operate.

There is another kind of brokers more focus on buying and selling technology and inventions working as marketplaces, where they serve as a platform where companies places their technology and I&D results for sale. Some examples are yet2.com, Idea Trade Network, Innovaro Pharmalicensing, or iStockphoto.

At present, there wasn't found, in the literature, any evidence of a crowdsourcing innovation intermediary which integrates the three value added modules – technology transfer, community building and mediation tasks – and that systematize what should be the functions that this type of intermediary should realize.

The aim of this study is to identify, in the literature, the functions to be performed by an intermediary of crowdsourcing innovation. Therefore are formulated the following questions:

1) What should be the functions of a crowdsourcing innovation intermediary? And

2) What is the relation between each function?

This paper is organized as follows. The next section explains the methodology used for conducting this study. After we present the functions for crowdsourcing innovation intermediary model emerged from the literature. Finally some conclusions are made and indicated guidelines for future research.

2 METHODOLOGY

The strategy used to review the literature of this study was the search of papers in ISI Web of Knowledge, SCOPUS databases and AIS e-library.

Keywords were chosen considering the formulated research questions. These keywords covered the three areas of knowledge involved in the phenomenon of intermediation of crowdsourcing innovation: open innovation, crowdsourcing and knowledge intermediation.

Therefore, the keywords used in this literature review were the combination of "open innovation", "crowdsourcing", "innovation", "technology intermediary", "technology broker", "virtual technology broker", "knowledge intermediary" and "knowledge broker". These keywords were search on title and/or subject of documents, and in papers published since 2004. The selection of the document was made by the relevance of the abstract.

When the full text of the documents was not available from the database engine, it was used the Google Scholar search engine and, sometimes, the authors of the document were contacted.

It were also recovered some papers referenced in the papers analyzed, and carried out a search for more recent papers that could be referencing the most cited of the papers collected.

The methodology to bring out the functions of intermediaries for crowdsourcing innovation was to use grounded theory analysis on the selected papers (Corbin and Strauss, 2008; B. G. Glaser, 1992; B. Glaser and Strauss, 1967; Strauss and Corbin, 1990). The basic premise essential to grounded theory is that the theory must emerge from data rather than from preconceived notions formulated by the researcher. This must go beyond a purely descriptive account to a theoretical formulation of the phenomenon being studied. The data collection and analysis were deliberately interweaved, a process known as theoretical sampling, so that subsequent questions could be revised to reflect and check the emergent grounded theory (Richards, 2005).

Papers were consecutively analyzed with QSR NVivo 8.0 software according to the constant comparative method, seeking to answer the research questions, discovering what is known in literature about technology and knowledge intermediation, open innovation and crowdsourcing innovation processes. Following these guidelines, the first step of the analysis was open coding, and the unit of analysis in the text was the sentence, half of a sentence and, a few times, a paragraph. The derived codes were formulated in words closely resembling present in papers. Codes were compared to verify their descriptive content and to confirm that they were grounded in data. As a second step the codes were sorted in nine categories. This was made by constant comparisons between categories and codes. Collecting papers has been completed when the information of new papers does not add anything new to the information already gathered.

We analyzed 17 papers in the time interval of 2004 to 2011. In these papers we found references to 5 others published before 2004. Table 1 shows all the papers selected and included in this analysis, organized by knowledge area.

Knowledge area	Papers searched	Papers recovered
Open Innovation	(Gassmann & Enkel, 2004); (Chesbroug, 2007); (du Preez & Louw, 2008); (Wallin & Von Krogh, 2010); (Huizingh, 2011)	(Chesbrough, 2003)
Crowdsourcing	(Trompette, Chanal, Pelissier, & Pascale Trompette, 2008); (Brabham, 2008); (Vukovic, 2009); (Ramos et al., 2009); (Schenk & Guittard, 2011); (Geiger, Seedorf, Schulze, Nickerson, & Schader, 2011)	
Intermediaries	(Verona, Prandelli, & Sawhney, 2006); (Howells, 2006); (Hacievliyagil, Maisonneuve, Auger, & Hartmann, 2007); (Winch & Courtney, 2007); (Lopez-Vega & Vanhaverbeke, 2009);	(Bessant & Rush, 1995); (Hargadon & Sutton, 1997); (Hargadon, 1998); (Hargadon, 2002)

(Meyer, 2010)	

Table 1 - List of papers analyzed

The steps of analysis were not strictly sequential, rather, we moved forward and backward, constantly reexamining data, codes, categories and the whole model.

In this analysis we have empirical knowledge mainly from papers related with technology and knowledge intermediation, theoretical knowledge from papers on open innovation and crowdsourcing innovation issues.

To ensure the validity of the analysis and the coding process, a second researcher was consulted as auditor throughout the entire data analysis process to assist the primary author by challenging ideas, assisting in the construction of the categories, and building the model (Corbin and Strauss, 2008; B. G. Glaser, 1992; B. Glaser and Strauss, 1967; Strauss and Corbin, 1990).

In the next section will be presented and discussed the model of functions for crowdsourcing innovation intermediaries that arose from this literature analysis.

3   FUNCTIONS FOR CROWDSOURCING INNOVATION INTERMEDIARIES

The framework for crowdsourcing innovation intermediaries that emerged from the documents analyzed synthetizes eight main functions that can be performed by a crowdsourcing process, namely, diagnoses, mediation, linking knowledge, community, evaluation, project management, intellectual property (IP) governance and marketing and support. These functions are associated with crowdsourcing intermediation process which covers all the crowdsourcing activities that can be realized by the broker (Figure 1).
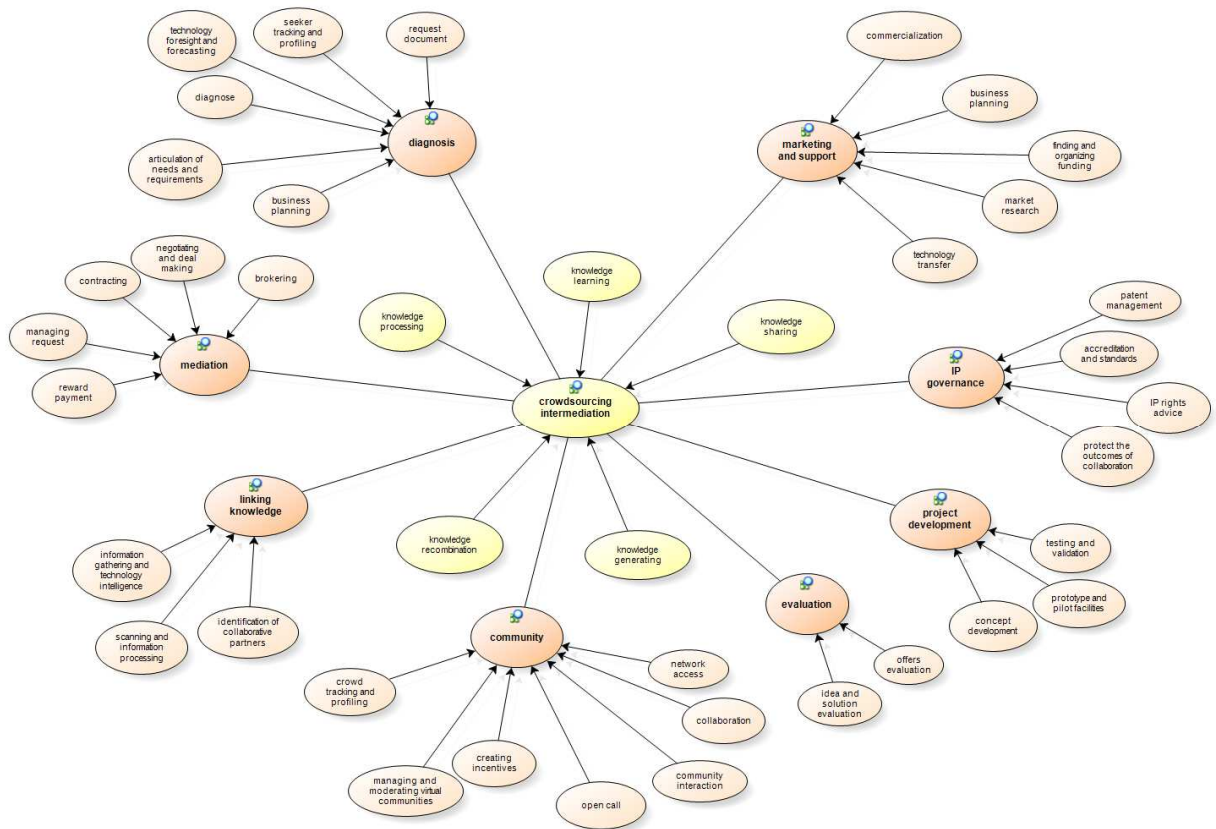

Figure 1. Framework for crowdsourcing innovation intermediaries.

The crowdsourcing intermediation process emerges from five functions – knowledge processing (KP), knowledge recombinition (KRe), knowledge generating (KG), knowledge learning (KL) and knowledge sharing (KS) – that can be executed recursively within all the crowdsourcing processes.

In KP, knowledge are captured, absorbed, codified, integrated and stored in the brokers' knowledge repository. This information can be captured outside the broker, by searching activities in the market or in community daily activity, and inside the broker when performing mediation activities.

The KRe combines and recombines knowledge already existing in the brokers' repository and with external knowledge, to be applied in solving new problems. This process uses the KP for codifying external knowledge. The new knowledge created as a result of the (re)combination process will be absorbed and integrated in the repository. KG focus the global knowledge creation, the ability of recognizing the value of new information, assimilating it, and generating new knowledge. This process needs capacities of inference and evolving of brokers' knowledge model. The broker needs to have the ability to learn from alliances, joint ventures, collaborative partners and also from knowledge of their partners' partners, assimilating and integrating that knowledge to its own use. The broker must also be able to externalize its knowledge, enabling partners to learn. This KL function usually involves the KP and KG functions to assimilate, codify, create and store knowledge. In KS, the intermediary will provide mechanisms for sharing knowledge and experience related with all the crowdsourcing processes, allowing the transfer of knowledge to its partners – seekers and solvers.

Gassmann & Enkel, (2004) illustrate these features by describing the experiences on projects of IBM: "*The knowledge gained through the ISL workshops in Zurich Rüschlikon forms an important basis for IBM research.*" and "*the gathered information on technology and market trends that research and development labs' leaders have provided within a 6- to 9-month period, is combined with information from competence centres' R&D experts as well as with the results from surveys of those IBM employees who participated in conferences and workshops.*"

As Verona, Prandelli, & Sawhney (2006) pointed out information sharing activities should be facilitated with the use of appropriate tools: "*coordinate activities and information sharing between otherwise disconnected pools of knowledge and competences on a global basis and at a lower cost than in traditional offline environments*".

The **diagnosis** function results from tasks that establish the first contact with companies, including identity tracking and profiling; foresight and diagnostic work; articulation and selection of innovation and technology options, helping to define and articulate the needs and requirements; business planning and analyzing the capability to integrate with the business process and defining the innovation and business strategy; technology foresight and forecasting giving companies the opportunity to get to know technological, market and industry trends or current project outcomes; and specifying the challenge that will be delivered to the crowd, describing the task and its requirements, evaluation criteria, expected outcome, duration, expiration, quality parameters and incentives.

There are examples of the need and benefits of the diagnosis function: "*LGC (formerly the Laboratory of the Government Chemist) acts an 'intelligent interface' between its client and its 'task environment' in relation to analytical, environmental and testing matters. This includes providing advice on what the client company should be doing in the future with regard to analytical activities, how it should react to the changing regulatory environment, providing hazard assessments, and outlining what improvements can be made in relation to measurement and testing techniques and so on.*" (Howells, 2006); "*BMW's Palo Alto Technology Office (PAYTO) in Silicon Valley has the mission to permanently look out for new trends, highly specialised and unique technical knowledge and technologies*" (Gassmann & Enkel, 2004); "*Generics Group has established Generics Asset Management to help identify market opportunities*" (Howells, 2006).

The **mediation** function realizes activities of gatekeeping and brokering involving collaborative deals and contracting with companies and solvers; negotiating and dealing issues such as billing; intellectual property (IP) advice and patent licensing with other companies in order to get ideas to market, allowing the commercialization through active know-how transfer projects and licensing of those patents that cannot be developed efficiently in-house, or do not fit the innovation strategy of the company; provide companies to management its requests with tasks like canceling or follow the requests progress; and companies payment and awards to solvers.

The mediation activities that the intermediary should perform are reported by different authors: "*Before providers undertake the execution of the crowdsourcing request, the platform acts as a broker between requestors and providers in establishing IP governance, legal issues and payment.*"... "*support contract negotiation through integration with IP governance services*" (Vukovic, 2009); "*... intellectual property in fields such as negotiation, acquisition and portfolio analysis of technologies*" (Lopez-Vega & Vanhaverbeke, 2009); "*... keeping and brokering roles necessitate more outward looking activities associated with match-making and brokering collaborative deals for the client firm(s)*" (Howells, 2006).

The **Linking knowledge** function embraces tasks of information scanning and recognition, gathering, analyses and consolidation, including knowledge recombination, integration and storage in the broker repository; technology intelligence functions filling the gap in the flow of technology between industries and between firms; and identifying of collaborative partners by seeking and establishing contacts with potential external partners, and building collaborative teams and strategic alliances for developing and exploiting innovation technology projects.

Some authors emphasizes the activities of collecting, processing and integration of knowledge as the key activities of the intermediary: "*The main value appropriation functions are: gatekeeping designed to connect or involve individual potential solutions providers*" … "*scanning and information present in the strategic advisory services for customers.*" (Lopez-Vega & Vanhaverbeke, 2009); " *... information is analysed and consolidated into approximately 20 fields, which the research departments then discuss and further group ...*" (Gassmann & Enkel, 2004); " *... knowledge creation, integration, and reconfiguration become vital to sustaining competitive advantage ...*" (Verona et al., 2006). Hacievliyagil et al., (2007) also highlight the need of building alliances and collaborative teams: " *... the request for information form was primarily used to identify consultants and experts, but also to build a supplier network on a contract basis.*".

The **community** function involves all the issues related with network access to a heterogeneous crowd with high qualified and motivated individuals and/or companies to realize tasks for a reward or to collaborate in the development of an innovation project. The activities performed are tracking and profiling, moderating, potentiate idea generation, making available learning and socialization opportunities in order to sustain a sense of a learning community and creating incentives adequate to the best interests of the crowd. This function must have means to support community interaction and jointly participation in the development of a project or solving a problem in a collaboration call. This interaction tends to result in an intensive exchange of knowledge and a process of mutual learning, that must be stimulate to discussions on mutual issues.

Regarding activities related to the community of solvers authors highlight the encouraging of interaction between members and the incentives for participation in the resolution of challenges: "*Collaboration services (e.g. forums, instant messaging, etc.) allowing for requestors and providers to socialize crowdsourcing request requirements and negotiate terms in real time ...*" (Vukovic, 2009); "*... leading scientists, suppliers, customers and potential partners are invited to provide the company's research as a whole with external input and to stimulate discussions on mutual issues.*" (Gassmann & Enkel, 2004); "*During the duration of contest, requestors and participants may collaborate and discuss the requirements and approach ...*" (Vukovic, 2009); "*A financial reward provides a strong incentive to tackle a problem and share the solution, instead of attempting to exploit it independently.*" (Hacievliyagil et al., 2007).

The social knowledge created by the community has a result of users' participation, experience and interactions, and collaborative knowledge evolution will be captured and integrated in brokers' repository. Also the information about users and challenges ratings and performance will be integrated.

The **evaluation** function is about providing methods to analyze and evaluate solvers' contributions as well as bringing new technology to the market, as presented in: " *... requestor validates it against the completion criteria...*" (Vukovic, 2009); "*All problems posted are classified ...*" (Hacievliyagil et al., 2007); " *... assessment and evaluation roles provided by innovation intermediaries to essentially service 'post innovation' evaluations ...* " (Howells, 2006).

The **project management** function represents the concept development of technology, product, or service and prototype building. It can also be including scale-up modeling, testing and validation, and training, as Vukovic and Hacievliyagil et al. refers: " ... *supports the product development and testing and reaps the benefits of scalable workforce, and expertise matching* ... " (Vukovic, 2009); "...*functions in the value chain ... methodologies for facilitating concept design, production, piloting and technological dissemination* ... " (Hacievliyagil et al., 2007).

The **IP governance** function manages and advices the best way to protect the intellectual property of the solver; it also supports the seeker's patent management efforts, which may include accreditation, validation, regulation and work standards work as well as protecting some IP outcomes occurred in collaborative work.

Gassmann & Enkel, (2004) focus patent management and IP protection: " ... *patent licensing to outside partners in order to get ideas to market through its own licensing programme ... generating profits by licensing IP and/or multiplying technology by transferring ideas to other companies* ..."; Howells, (2006) the accreditation " ... *accreditation functions in the innovating process* " and the protection of collaboration projects "*The last two main functions were associated with protecting the outcomes of innovation and collaboration.*".

The **marketing and support** function supports the commercialization tasks of seekers by performing market research and business planning for the innovative projects selected from the crowd, finding potential capital funding and organizing funding or offerings. Other role the broker identified was to search for venture capitals to finance the projects, to guarantee the transfer of knowledge and technology and its integration in seeker's business process.

Vukovic, (2009) and Howells, (2006) emphasize the need to integrate broker activity with company business process: " ... *capability to integrate with the business process (internal infrastructure of the enterprise).*"; " ... *development and implementation of business and innovation strategies* ... " (Howells, 2006); and Howells, (2006) also refers helping in funding and market access " ... *Generics Group has established Generics Asset Management to help identify market opportunities, develop business plans and to assess and provide filtering capability for funding* ...".

4 CONCLUSIONS AND FUTURE WORK

Innovation intermediation has been carried out for several years. The functions provided by each broker differ depending on market range, region where they operate and process virtualization. Even in brokers working in the same country and in the same market are playing distinct roles in supporting companies' innovation strategy (Howells, 2006).

Crowdsourcing innovation appears as a new way for supporting companies' innovation process and developing their innovation strategy. Nevertheless, no intermediary model can be found in literature that integrates processes for crowdsourcing, open innovation and innovation intermediation.

This paper presents a first model of the functions of a crowdsourcing innovation intermediary according to the performed literature review. The literature analyses were carried out applying the systematic and rigorous rules defined by the grounded theory method.

The model synthesizes eight main functions – diagnoses, mediation, linking knowledge, community, evaluation, project management, IP governance and marketing and support. These functions are associated with a learning cycle process which covers all the crowdsourcing activities performed by the broker

This model has emerged from the functions the literature mentions for innovation intermediaries, open innovation processes and crowdsourcing innovation processes.

This work has two limitations: (1) Howe, (2008) breaks crowdsourcing into four models, according with the innovation goal: (i) collective intelligence or crowd wisdom – based on the creation of large and diverse networks of people, who often possess unique knowledge, offering them conditions to express that knowledge; (ii) crowd creation – content created by users like videos, photos, papers, that can be outsourced by companies; (iii) crowd voting – is about using the crowd's judgments to organize

vast quantities of information. This can be made by asking the crowd to explicitly vote in something or simply organizing documents according to its popularity among readers; and (iv) crowd funding – using the crowd as the source of funds instead of banks or other institutions. Usually the open software projects use this kind of model. Though, it's worth to notice that a successful crowdsourcing project often use a combination of these approaches. It is necessary to examine the details of each of the models identified by Howe as they may add new functions to the model. (2) Gassmann and Enkel, (2004) presented three distinct archetypes for the innovation core processes in companies following an open innovation approach: the outside-in process, inside-out process and coupled process. Basically, these processes are adopted in accordance with the innovation strategy defined by the company. In the outside-in process the knowledge of the company is increased by the integration of suppliers, customers and external knowledge. The inside-out process is about bringing ideas to market by selling intellectual property and multiplying technology by transferring ideas to other companies. And the coupled process combines the outside-in with the inside-out processes by working in alliances and collaboration with complementary partners in strategic networks. Some of the stages of these processes are already represented in the model in the categories of articulation of needs and requirements, technology foresight and forecasting, IP advice and patent management, network access, offers evaluation, or protect the outcomes of collaboration. However, it is need to perform a more detailed research to ensure that all the activities of these three architectures are included in the model.

The next step of this research should be to take a closer look of different types of processes of open innovation and crowdsourcing models.

The study of crowdsourcing innovation intermediaries should also be done by listening to experts in the field of innovation intermediation, participants in crowdsourcing initiatives, and innovation consultants who have knowledge and expertise in the subject.

Future research will include further literature analyses on the issues pointed above and conducting an empirical study by interviewing a panel of specialists in crowdsourcing innovation initiatives. The empirical study results will complement and confront the model that emerged from the literature review.

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