Open Innovation Management on Crowd-based Platforms

An Analysis of Managerial Approaches to Knowledge Sharing, Crowd Control and Intellectual Property Protection

Birute Birgelyte

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Author:	Birute Birgelyte
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Supervisor (Arcada):	Tomas Träskman
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Abstract:

This study examines open innovation (OI) management practices on 3 crowd-based innovation management platforms: Imaginatik, Spigit and 100%Open. The main aim of this study is to analyze managerial approaches to knowledge sharing, crowd control and intellectual property (IP) protection on the platforms in the context of the theories of open innovation, innovation management and collective intelligence (CI). The main research method was qualitative content analysis. The study used the non-probability purposive sampling technique to highlight the individual character of managerial approaches to knowledge sharing, crowd control and IP protection on the selected platforms. The research data were collected during semi-structured interviews with 4 platform management representatives. The interviews were conducted online, and then transcribed. The study has found that the platforms take various approaches to knowledge sharing / information exchange, crowd control and IP protection. There is no one-size-fits-all approach: the network-based business model of the platforms determines the complexity of managing crowd-based innovation projects. To facilitate knowledge sharing / information exchange between firms and the crowd (RQ1), the platforms take various approaches, and structure project-related communications through different mechanisms. To strike a balance between crowd control and creative autonomy (RQ2), the platforms balance their crowd control mechanisms with crowd self-control. If intrinsically motivated external professionals are given enough freedom to explore their creative ideas within the limits of project objectives, balancing crowd control and creative autonomy becomes a viable option as well (RQ2). To protect firms' IP during their cooperation with the crowd (RQ3), the platforms use different IP protection mechanisms. In each case, firms also need to carefully consider how much they should open up their innovation process to third parties, as recommended by Lee et al. (2010), in order to control access to their IP. In addition, they should allow the platforms to balance their IP protection measures with their efforts to facilitate the exchange of relevant knowledge between all parties involved in co-innovation, to refer to Lakhani and Panetta (2007). Finally, the study discusses practical implications of the research for managers of diverse open innovation projects, addresses research limitations, and raises questions for further research.

Keywords:	open innovation, management, crowdsourcing, collective intelligence, knowledge, intellectual property
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CONTENTS

1 INTRODUCTION

The field of innovation management has changed significantly over the past few decades. There has been a dynamic shift in innovation management models (Vo et al., 2011). For example, corporate entrepreneurship (Burgelman, 1983) was replaced by open innovation (OI) (Chesbrough, 2003a) and design thinking (Martin, 2009). In particular, open innovation has gained prominence rapidly. It started as a little-known practice outside high-tech industries, and within a few years became "a widely discussed and implemented innovation practice" (Gassmann et al., 2010: 1). One of the key factors behind such rapid growth is globalization. Internationally-oriented industries prefer the open innovation model because it helps achieve economies of scale faster than the traditional closed innovation model and establish a strong global position of standards and dominant designs (Anderson and Tushman, 1990; cited in Gassmann, 2006: 224). The prominence of open innovation is likely to grow further as the argument that it can be applicable not only to new product development has been put forward. Consequently, the concept of open innovation becomes relevant to firms which are not directly involved in production, namely software as a service (SaaS) providers or commodity suppliers (Vanhaverbeke and Chesbrough, 2013).

A recent development in the field of open innovation is the network-based business model (Osterwalder and Pigneur, 2009). It marks a shift towards more active cooperation with external partners in order to exploit their competences and skills, thus compensating one's weaknesses. It also involves adjusting one's competences to the core competences of one's partners. That kind of cooperation mostly takes place on web-based platforms. Its ultimate goal is "to achieve synergetic, network-level benefits" (Lindgren et al., 2010: 5). The network-based business model is also relevant in the context of crowdsourcing: firms can expand their partnership networks by collaborating with the crowd, whose expertise spans different fields. If properly managed, that cooperation helps build exceptional intellectual capital (IC), which gives a competitive advantage.

Many modern platforms operate as two-sided networks. Users on one side of the network benefit if there are more users on the other side of the network. Decisions on one set of customers and products can have a profound impact on another customer group's demand for a different set of products (McAfee and Brynjolfsson, 2017). In the context of crowdsourced innovation management, this means that if platform vendors fail to provide satisfying service to their client firms, they are likely to stop

using those platforms altogether, thus decreasing the vendors' supply of projects for innovators – their secondary clients. Therefore, a client firm's decision to leave a platform decreases the advantages of staying on that platform for innovators so many of them leave too.

Since crowd-based innovation management platforms operate as two-sided networks, there are complex buyer-supplier relations. A clear distinction between buyers and suppliers cannot be made: firms, innovators and platform vendors act as buyers and suppliers interchangeably. Firms supply projects, innovators supply their expertise, whereas platform vendors process their input and mediate the exchange of goods (i.e. projects and expertise) between them. In this context, so-called *networked disruption* takes place: crowd-based innovation management platforms challenge conventional clear-cut roles of buyers and suppliers, thus disrupting well-established business practices and transforming trade into complex networks of business interests and transactions.

1.1 Research focus

This study will examine open innovation management practices on 3 crowd-based innovation management platforms: Imaginatik, Spigit and 100%Open. There are 3 main **research questions** (RQ):

(1) How to facilitate knowledge sharing / information exchange between firms and external professionals (i.e. the external crowd)?
(2) How to strike a balance between crowd control and creative autonomy?
(3) How to protect the intellectual property (IP) of firms during their cooperation with the crowd?

The main aim of this study is to analyze managerial approaches to knowledge sharing, crowd control and IP protection on the selected crowd-based innovation management platforms in the context of the theories of open innovation, innovation management and collective intelligence (CI). This research topic has been chosen for several reasons. Firstly, many firms do not have enough intellectual resources to develop innovative solutions in-house. Consequently, they have started exploring outsourcing options. There is considerable interest in utilizing the potential of crowd wisdom. It has been acknowledged that crowd-generated solutions give a competitive advantage: collaboration with the external crowd helps firms become more innovative and reduce operational costs. However, crowdsourcing has also brought a lot of managerial challenges. Since it is a relatively new cooperation format, there are no well-established practices yet. Managerial decisions are often based on one's

personal judgement rather than a set of clearly-defined rules or recommendations. Moreover, the emergence of user-friendly information and communication technologies (ICTs) has encouraged active participation in the open innovation process. In particular, crowd-based innovation management platforms have facilitated cooperation between firms and contributors from diverse professional backgrounds. Those platforms have also given the opportunity to expand one's pool of partners to an unprecedented level. That in turn has raised the question of effective crowdsourced information management in order to ensure that firms can establish online networks of contributors (partners) that they could rely on in the future.

1.2 Key concepts

This study mainly focuses on 4 concepts: (1) *open innovation,* (2) *crowdsourcing*, (3) *collective intelligence* and (4) *intellectual property*. In 2003, Chesbrough (2006: 1) coined the term *open innovation* to define "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively". Open innovation is based on the principle that firms need to open up their internal innovation process by utilizing externally developed technologies in order to extract more commercial value from innovation (Chesbrough, 2003b; 2003c). There are 3 forms of open innovation: (1) outside-in (i.e. knowledge inflows), (2) inside-out (i.e. knowledge outflows) and (3) coupled (i.e. mixed) (Gassmann and Enkel, 2004). Chesbrough (2003a) notes that open innovation should be understood as a 'continuum of openness', ranging from high to low.

The concept of *crowdsourcing* refers to the outsourcing of business activities to an independent crowd of people (Howe, 2006). Crowdsourcing involves collective work on tasks which are typically assigned via web-based platforms, applications or social media. Usually, there is one large-scale project which is split into multiple individual tasks (*Investopedia*, 2017). Therefore, crowdsourcing can be seen as "the distribution of problem solving" among a large group of people (Goodrich, 2013). This collaboration format is preferred by firms which want to access external expertise without incurring extra overhead expenses. It often takes the form of freelancing or volunteering (*Investopedia*, 2017).

To better explain the concept of *collective intelligence*, it should be decomposed etymologically. The term *collective* refers to "a group of individuals who are not required to have the same attitudes or

viewpoints". The diversity of perspectives leads to better explanations and approaches to a given problem. The term *intelligence* denotes the ability to learn, understand and adapt to a changing environment, and to deal with challenging situations by using one's own knowledge (Leimeister, 2010: 245). The MIT Center for Collective Intelligence combines these 2 terms to define "groups of individuals doing things collectively that seem intelligent" (Malone et al., 2009: 2). According to Surowiecki (2004), the best collective decisions are made through competition between diverse independent opinions.

According to the Legal Information Institute (LII), the term *intellectual property* (IP) refers to any product of the human intellect that is legally protected from unauthorized use. There are 4 main categories of IP: (1) patents, (2) copyrights, (3) trademarks and (4) trade secrets (Legal Information Institute, 2019b). A patent is a license which grants the exclusive right to make, use, sell and import the patented invention for a certain period of time (Legal Information Institute, 2019c). A copyright grants the exclusive legal right to publish, reproduce, distribute or sell one's original work (Legal Information Institute, 2019a). A trademark refers to a word, phrase, name, symbol, design or any combination of elements used to identify and distinguish one's goods from the goods of other manufacturers or sellers (Legal Information Institute, 2019d). The term *trade secret* denotes any information (e.g. a formula, method, technique or process) that generates or has the potential to generate economic value from remaining undisclosed to third parties (Legal Information Institute, 2019e).

1.3 Text structure

This article consists of 6 sections. Section 1 has provided a context for the research, has presented the research questions and the rationale for the study, and has defined the key concepts used in the study. Section 2 reviews academic literature which will form the theoretical basis for answering the research questions. Section 3 introduces the research methodology. Section 4 presents the results of the analysis. Section 5 discusses practical implications of the research for managers of diverse open innovation projects, addresses research limitations, and raises questions for further research. Section 6 provides conclusions.

2 LITERATURE REVIEW

Innovation determines competitive advantage (Abdul-Hadi and Junbae, 2012; Dyer and Singh, 1998; Hidalgo and Albors, 2008). Firms need to combine their resources to develop and launch innovative products (Dyer and Singh, 1998; Vanhaverbeke et al., 2008). Dyer and Singh (1998) emphasize that partners need to merge their resources in unique ways and co-invest in their project in order to succeed. Teece (2007) claims that a sustainable competitive advantage cannot be achieved only by utilizing 'difficult-to-imitate resources', but also requires developing 'difficult-to-replicate dynamic capabilities'. One of the key resources in business is knowledge (David and Foray, 1995; Machlup, 1962). David and Foray (1995) note that the ability to create an 'efficient system of distribution and access to knowledge' boosts innovative opportunities. Hidalgo and Albors (2008) argue that knowledge-based innovation requires the convergence of many different types of individual knowledge, i.e. *collective intelligence*. Therefore, there is a direct link between knowledge management and innovation management (Coombs and Hull, 1998; Hidalgo and Albors, 2008). In contrast to traditional top-down command and control management, innovation management is undergoing a fundamental change in organizational strategy, which causes a variety of managerial challenges (Hidalgo and Albors, 2008). For example, firms need to establish an integrated network of internal and external partnerships (Ahuja, 2000); create flexible and adaptive organizational structures to respond to external change in a timely manner (Schlegelmilch et al., 2003) as well as develop an innovation strategic vision to strike a balance between process efficiency (i.e. order) and destructive innovation (i.e. chaos) (Martensen and Dahlgaard, 1999), to name a few. Furthermore, providers of knowledge-intensive business services (KIBS) need to develop innovative work structures, business models, design and marketing techniques (Bullinger et al., 2004); invent and implement techniques that would ensure top-line growth and bottom-line efficiency (Liyanage and Poon, 2002); properly assess and apply the most appropriate technology in a given context to retain enterprise competitiveness (Ram, 1996) as well as utilize relational tools for doing business both internally and externally to gain a competitive advantage (Lengrand and Chartrie, 1999).

According to Hidalgo and Albors (2008), having cutting-edge technology is not an essential precondition for innovation. It depends more on the firm's ability to apply its knowledge to improve its internal operations and external relationships. Because of a variety of business types and circumstances, there is no universal innovation management model. One of the newest models is *open*

innovation (Chesbrough, 2003a), also known as *collective intelligence* (Kittur and Kraut, 2008; Leimeister et al., 2009; Surowiecki, 2004). However, just like any other previous model (e.g. corporate entrepreneurship (Burgelman, 1983) or design thinking (Martin, 2009)), it has not yet solved the 4 central problems in innovation management identified by Van de Ven (1986: 591): (1) 'the human problem of managing attention', (2) 'the process problem' of the implementation and institutionalization of innovative ideas, (3) 'the structural problem of managing part-whole relationships', caused by "the proliferation of ideas, people and transactions", and (4) 'the strategic problem of institutional leadership' (i.e. the challenge of developing infrastructure, strategy, structures and systems that facilitate innovation). In addition, the open innovation model has not overcome the challenge of increased coordination costs of multi-party projects (Almirall and Casadesus-Masanell, 2010). Furthermore, many firms still lack a clear understanding of the internal and external mechanisms of open innovation, and thus cannot fully profit from it (Enkel et al., 2009). For instance, they are unaware that the open innovation model can be applied not only to new product development (Vanhaverbeke and Chesbrough, 2013), or that they should try to access open innovation activities of other firms if they cannot organize them internally (Vanhaverbeke and Roijakkers, 2013). There is also a lack of awareness that the full potential of open innovation cannot be unleashed if it is not integrated into corporate strategy (ibid), or that it is more beneficial to have an 'ambidextrous' firm, i.e. the one that is able to exploit its competences (e.g. satisfying customer needs) and explore new opportunities (e.g. new product development) simultaneously (Janssen et al., 2012; Tushman and O'Reilly, 1996). Moreover, the industry of open source software (OSS) development faces the challenges of motivation, integration and the exploitation of innovation (West and Gallagher, 2006).

One of the central themes in open innovation management is 'the emerging phenomenon of creation nets', where multiple participants collaborate to create and utilize new knowledge (Brown and Hagel III, 2006). Firms still need to learn how to collaborate with communities that cannot be owned nor fully controlled. In order to influence the community and align its work agenda with one's business needs, enterprise representatives are often assigned to approach the most influential community members (Dahlander and Wallin, 2006). Results-driven management of 'creation nets' (Brown and Hagel III, 2006) requires long-term incentives that motivate project participants to make valuable contributions as well as new managerial approaches. For example, managers need to choose the right work coordination format, balance local innovation with global integration, design effective action points and establish useful performance feedback loops (Brown and Hagel III, 2006). In addition, there

is a need to organize knowledge transactions with the environment. Knowledge management is based on 3 core tasks (decisions): (1) 'knowledge acquisition' (*Make or Buy*), (2) 'knowledge integration' (*Integrate or Relate*) and (3) 'knowledge exploitation' (*Keep or Sell*) (Lichtenthaler and Ernst, 2006). Lichtenthaler (2007) has also identified 3 main principles that firms need to follow to achieve strategic fit in the keep-or-sell decision: (1) coordination, (2) centralization and (3) collaboration. Firstly, the exploitation of external knowledge should be considered a strategic activity. Then that strategy should be aligned with other organizational strategies (coordination), and a clear direction should be set (centralization). Finally, cross-functional collaboration should be fostered to overcome interface problems.

The meaning of collective intelligence has changed in recent years due to a sharp increase in web-based applications and user-generated content (UGC). New easy-to-use information and communication technologies (ICTs) have enabled users to generate an unprecedented amount of content. Mass participation and goal-oriented collaboration on online platforms have resulted in user empowerment, also known as *collective power* (Leimeister, 2010). However, harnessing the potential of technology-enabled collective intelligence still poses a lot of challenges. For instance, firms need to develop internal information protection mechanisms (Bonabeau, 2009; Leimeister, 2010), consider legal aspects of knowledge outsourcing and design safeguards against undesired outcomes of such collaboration (Leimeister, 2010). They also need to decide how to formalize the acquisition of intellectual property (IP) created during crowd-based projects (Bonabeau, 2009; Leimeister, 2010). Furthermore, various team management issues should be addressed. More specifically, there is a risk that a high level of team diversity might bring infeasible solutions if the right crowd control mechanisms are not set (Page, 2007). On the other hand, too much uniformity in team composition might lead to distorted (biased) decisions (Bonabeau, 2009). Groups are more likely to rely on cognitive heuristics and bias than individual decision makers (Kerr et al., 1996). Too homogeneous groups are also less creative than diverse groups (Aggarwal and Woolley, 2012). In addition, the quality of collective output will be poor if all project participants do not have sufficient knowledge to make valuable contributions (Bonabeau, 2009).

Moreover, the right mechanisms for collective decision-making should be designed (Bonabeau, 2009). Designing a collective intelligence system should start from selecting suitable tasks and goals for group work (Locke et al., 1997). Special attention should be paid to the formulation of goals and its

implications. It has been observed that clearly-defined goals have a positive impact on group performance (O'Leary-Kelly et al., 1994; Weldon and Weingart, 1993). It should also be noted that the correspondence between group goals and individual goals determines the level of cooperation or competition within the group (Woolley et al., 2015). If internal competition occurs, group members tend to share less information (Toma and Butera, 2009), which compromises the effectiveness of collective work. Although peer competition can suppress creativity, competition with outside groups can in fact stimulate it (Amabile and Fisher, 2000). Finally, collective intelligence management requires taking into account the distinction between process-focused and outcome-focused teams to better address differences in work style. Teams with outcome focus are more likely to generate innovative and creative output and better adapt to challenges at work (Woolley, 2009), while process-oriented teams make fewer errors (Aggarwal and Woolley, 2013).

In a dynamic business environment, all relevant knowledge can rarely be found in-house. As Felin et al. (2017: 123–124) observe, "[...] the locus of knowledge and innovation increasingly is the network rather than the firm." Consequently, firms need to think how to utilize knowledge that resides outside their boundaries to enhance their innovative capacity (Lakhani and Panetta, 2007). In this context, external constituents such as different types of crowds should be seen as an extension or amplification of organizational rationality (Boudreau and Lakhani, 2013; King and Lakhani, 2013). Firms which do not have sufficient expertise but resist opening up their innovation process will face more challenges with knowledge-intensive tasks. Still, firms which are willing to experiment with 'hybrid organizational models' need to address the issues of decentralized problem solving, self-selected participation and self-organization, which characterize distributed innovation systems. Successful management of those systems requires relinquishing strict control of the input of external professionals and reliance on self-selection to tasks (Lakhani and Panetta, 2007). Thus, control of crowd-based creative production should be shared between outsourcing firms and the crowd (Brabham, 2013). To enhance participation, it is important to divide tasks into easily manageable sub-tasks and offer diverse tasks. Baldwin and Clark (2006) note that the more granular and diverse tasks are, the more participants projects are likely to attract. Firms facing crowdsourced information overload also need to find mechanisms for filtering out vast amounts of data to extract knowledge with business value (Ackoff, 1989; Felin et al., 2017).

Despite the shift towards innovation networks, theories of organizational design still emphasize formal authority, explicit work incentives (e.g. salary, bonuses, benefits or promotion prospects) and intrafirm design (Gulati et al., 2012). Therefore, the question of the design of distributed innovation networks, which extend enterprise boundaries (Lakhani and Panetta, 2007), is underexplored. To address that drawback, Kornberger (2016) has proposed 3 design mechanisms which structure communication, task coordination and control in distributed innovation systems: (1) interface design, (2) the design of architectures of participation and (3) the design of evaluative infrastructures. The main purpose of interface design is to structure access to and the exchange of information within a network (mediating function). Architectures of participation enable self-expression and meaningful contributions, and organize collaboration between network actors according to 3 task design principles: (1) modularity, (2) granularity and (3) low input integration costs (enabling function). Evaluative infrastructures such as rankings, ratings or reviews categorize and hierarchize new products, ideas and experiences within distributed innovation systems (valuation function), thus organizing sense- and decision-making.

To better utilize knowledge dispersed both in-house and outside enterprise boundaries (Lakhani and Panetta, 2007), the entire innovation management process is often moved to crowd-based innovation management platforms, which enhance co-ideation and help structure collective input. Minor et al. (2017) have found that the key variable that determines the success of any innovation programme run on such platforms, regardless of the type of innovation sought (i.e. disruptive or incremental innovation, product or process innovation), industry or firm size, is the ideation rate, defined as "the number of ideas approved by management divided by the total number of active users in the system". Breaking down the concept of ideation, they have identified 4 variables which increase the ideation rate: (1) project scale, (2) challenge frequency, (3) participant engagement and (4) team diversity. Project success directly depends on the number of participants: the more active participants projects can attract, the more likely they can 'out-ideate' small teams of professionals with solid expertise. To get more ideas worth implementing, firms need to ensure a steady supply of idea challenges to work on. To boost participant engagement, participants should be actively involved in the idea evaluation process: they should be encouraged to critically evaluate if suggested ideas are worth implementing, or should be asked to refine them. Finally, to get better co-ideation results, it is important to have a team with diverse expertise and cognitive abilities.

The open innovation model is based on the assumption that innovation can be managed effectively in innovation ecosystems as they ensure that no good ideas are wasted. Since firms assess business opportunities differently, innovative ideas flow freely across enterprise boundaries until they reach firms which are willing to explore them further (Geerts, 2009; Hall, 2010). The role of intellectual property (IP) is crucial here: in contrast to the closed innovation model, IP policies are no longer used to protect innovative solutions from unauthorized use. Their main role is to facilitate knowledge exchange among project participants (Chesbrough, 2003a; Chesbrough et al., 2006; Geerts, 2009; Lakhani and Panetta, 2007). Instead of building a large IP portfolio, firms need to adjust their IP policies to facilitate knowledge exchange within the network. There is no universal standard on how much openness and sharing IP policies should support. The degree of openness depends on the context of operations, industry norms and the business model (Lakhani and Panetta, 2007). IP management is also undergoing an attitude shift: it is no longer perceived only in terms of strict protection (i.e. secrecy) but also as a tradable good (i.e. openness). IP trade takes various forms such as auctions, patent funds, IP aggregators, IP insurers or intellectual commons. Although IP trade is still a relatively new activity, its potential for growing secondary markets has already been acknowledged (Gassmann et al., 2010).

To benefit from open innovation, firms need to adjust their intellectual property rights (IPR) management strategy and design tools for managing openness. They need to figure out how to interface openness with the closed innovation model, which underlies IP law, and how to open up their innovation process (Lee et al., 2010). The regulation of open innovation with IP law faces various challenges such as reconciling the interests of many claim holders (i.e. contributors, investors and co-inventors) or establishing openness in communication and knowledge sharing / information exchange between all parties involved in co-innovation. For example, patent law explicitly discourages any exchange of innovative ideas, as it does not grant protection for already known and published ideas (ibid). Furthermore, contracting for intangible innovation is also challenging as parties to the contract are not able to specify the result of their cooperation (Lee, 2009). Intangible innovation contracts are thus susceptible to incompleteness, which complicates making any agreement on sharing profits, costs, ownership and the use of that innovation in advance (Lee et al., 2010). Moreover, unclearly defined contract terms are subject to interpretation (Nystén-Haarala et al., 2010).

Team collective intelligence determines the success of team performance more than individual abilities do (Woolley et al., 2010). Team performance is directly linked to the group ability to process information effectively (Mesmer-Magnus and DeChurch, 2009). However, groups tend to base their decisions on irrelevant information (Larson, 2009), and often struggle with selecting and processing relevant information (Woolley et al., 2015). Their judgement can also be influenced by individual 'predecision preferences' (Davis, 1973), i.e. favouring one alternative before making a decision. To improve group decision-making, various techniques are used. For instance, group interaction can be structured by identifying key goals or questions and combining the information possessed by individual group members to answer those questions (Woolley et al., 2008). There is also the option to set up decision support systems, which structure individual inputs and facilitate the process of input integration (Woolley et al., 2015). Group decision-making can also be improved by taking the 'devil's advocate' approach, where group members advocate opposing points of view. To bring relevant facts into the discussion, all group members should be granted equal speaking time (ibid), which increases collective intelligence (Engel et al., 2014; Woolley et al., 2010). Real-time feedback on individual contributions to the discussion can improve group decision-making as well (DiMicco et al., 2004).

Eliciting high-quality collective input requires a distinct approach to team motivation. Various factors should be taken into account. For example, group-level monetary incentives are susceptible to free riding, which diminishes their effectiveness (Alchian and Demsetz, 1972; Lazear and Shaw, 2007). Reward interdependence can enhance team performance only if there is a high level of cooperation (Wageman, 1995; Wageman and Baker, 1997). Sometimes monetary incentives can suppress intrinsic motivation (Alchian and Demsetz, 1972; Lazear and Shaw, 2007), which is essential in creative problem solving (Woolley et al., 2015). Intrinsic motivation and creativity can be reduced by several external factors such as anticipated evaluation because of being observed, peer competition or constraints on work style and methods (Amabile and Fisher, 2000). In some cases, extrinsic motivation can in fact strengthen or at least does not undermine intrinsic motivation and creativity. Mostly that happens when financial rewards seem to confirm one's competence and the value of one's work (Amabile, 1993). Intrinsic motivation is essential in collaborative online contexts, often characterized by a variety of content, work autonomy and knowledge of results (Woolley et al., 2015). These 3 characteristics are most directly associated with intrinsic motivation (Hackman and Oldham, 1976). Intrinsic motivation in collaborative online contexts takes various forms such as task enjoyment, benefits of using co-innovations for individual purposes or social incentives such as gaining affiliation

with a community, establishing one's professional reputation or showing one's expertise within the community (Butler et al., 2007; Lakhani and Wolf, 2005; Lerner and Tirole, 2005; cited in Woolley et al., 2015: 156–157).

This literature review has introduced the open innovation model, open innovation management challenges and suggested approaches. It will form the theoretical basis for answering the research questions. This study will further explore the network-based business model in the context of crowdsourced information management. It will examine managerial approaches to knowledge sharing, crowd control and IP protection during crowd-based innovation projects, and will contextualize them within the theories of open innovation, innovation management and collective intelligence. This analysis will contribute to research on the design of distributed innovation networks, which extend enterprise boundaries (Lakhani and Panetta, 2007), by highlighting the complexity of eliciting, processing and utilizing crowdsourced information for business purposes. Furthermore, it will help identify different information management options during open innovation challenges, thus suggesting how to extract more business value from crowdsourced information.

3 METHODOLOGY

The main research method was qualitative content analysis. The study used the non-probability purposive sampling technique to highlight the individual character of managerial approaches to knowledge sharing, crowd control and IP protection on 3 crowd-based innovation management platforms with distinct service portfolios: Imaginatik, Spigit and 100%Open. The following platform management representatives were interviewed:

(1) Roland Harwood, Co-Founder and Managing Director of 100%Open, an innovation agency, which provides crowdsourcing and strategy consulting services;
(2) Katie Walsh, Lead Community Facilitator and Project Manager at 100%Open;
(3) Ralph Welborn, Chief Executive Officer (CEO) of Imaginatik, a provider of innovation management software and consulting services; and
(4) Don Morrison, Executive Vice President (EVP) of Spigit, an ideation management platform.

The interviews were conducted online (via Skype or e-mail), and then transcribed. To ensure better access to relevant data and an in-depth analysis of each case, the interviews were semi-structured.

The theoretical framework was based on 3 theories: (1) open innovation theory, (2) innovation management theory and (3) collective intelligence theory. Those theories were reviewed and discussed in Section 2. The juxtaposition of the theories aimed to provide a solid theoretical basis for analyzing the interview data from a multi-dimensional perspective. Moreover, it sought to contextualize different approaches to crowdsourced information management and to provide a better understanding of practical implications of different managerial decisions.

The study took a 4-step methodological approach to data: (1) interview design, (2) data collection during semi-structured interviews, (3) data classification into thematic categories and (4) thematic analysis. Firstly, a questionnaire covering the following topics was designed: (1) knowledge sharing / information exchange, (2) crowd control vs. creative autonomy and (3) IP protection on the crowd-based innovation management platforms. Secondly, the questionnaire was used to collect data during online interviews with the selected platform managers. The questionnaire was slightly modified in each case to elicit sharing one's managerial experience. Thirdly, the interview transcripts (data) were thematically structured. The themes were used as the main unit of the analysis structure. They were analyzed in separate subsections. Finally, the research findings were synthesized, and questions for further research were raised.

The study gave careful consideration to the following ethical issues: (1) informed consent, (2) respect for confidentiality, (3) respect for privacy and (4) IP protection. All necessary information about the study was provided to potential research participants in advance by e-mail so that they could make an informed decision about participation. Any concerns about confidentiality and privacy were addressed as well. The research participants were informed about the option of anonymous participation. All of them gave consent to be identified in the study. In addition, the semi-structured interview format allowed the research participants to reveal as much of their personal work experience as they felt comfortable sharing. Finally, proper credit for any IP used in the study was given. Both academics and research participants were credited as the sources of information appropriately.

4 AN ANALYSIS OF OPEN INNOVATION MANAGEMENT PRACTICES AT IMAGINATIK, SPIGIT AND 100%OPEN

4.1 Knowledge sharing / information exchange

As David and Foray (1995) observe, the ability to create an 'efficient system of distribution and access to knowledge' boosts innovative opportunities. Hidalgo and Albors (2008) argue that knowledge-based innovation requires the convergence of many different types of individual knowledge, i.e. *collective intelligence*. Knowledge-based innovation management takes different forms. In the context of crowdsourcing, the efficiency of distribution and access to knowledge depends on the efficiency of information exchange between firms and the crowd with diverse professional expertise. To achieve that efficiency, different approaches to the coordination of communication on the 3 crowd-based innovation management platforms are taken.

Ralph Welborn, CEO of Imaginatik, focuses on the design of open innovation challenges. He holds that the main challenge design principle should be transparency in terms of ideas, participants and interactions. He notes that a lot of innovation programmes and challenges fail because of a lack of transparency. He also stresses the importance of closing the "loop between identifying a challenge and taking up the challenge, assessing and prioritizing the results". In his opinion, failure to do so puts one's credibility within the crowd at risk. Welborn's recommendation on assessing and prioritizing the results addresses 'the structural problem of managing part-whole relationships' during the innovation process, caused by a large number of ideas, project participants and transactions. As Van de Ven (1986: 591) observes, "[...] individuals involved in individual transactions lose sight of the whole innovation effort" because of a multitude of functions, resources and disciplines needed to implement an innovative idea. If the results of teamwork are assessed and prioritized, as Welborn suggests, throughout the innovation process, team members are more likely to stay focused on project objectives while working on their individual tasks.

Don Morrison, EVP of Spigit, puts emphasis on strategy design: "We help our clients design their communications strategy, but we don't do the communication." His team, however, ensures that open innovation challenges are clearly defined and communicated to the crowd. Morrison argues that

challenge-related communications should be specialized. He also believes that information exchange between clients and external professionals should be transparent:

> "So the technology platform we use to run the challenge should allow all participants to see all ideas and to comment on all ideas and vote on all ideas. So there should be nothing that's held back. If you want to bring an external crowd into a challenge, you need to plan to be open and transparent, and all members should have equal access."

According to Morrison, challenge-related communications should be based on information transparency, openness and equal access to relevant information. He supports Welborn's view that information / communication transparency should be a key challenge design principle in order to increase communication efficiency during crowd-based projects, and thus facilitate the convergence of the individual knowledge of project participants, to refer to Hidalgo and Albors (2008). The convergence of diverse individual knowledge can significantly increase the efficiency of distribution and access to knowledge within the network and, consequently, boost co-innovation efforts, to refer to David and Foray (1995).

Roland Harwood, Co-Founder and Managing Director of 100%Open, thinks that all communication with the crowd should be based on a thorough customer needs analysis:

> "So we'll be having regular meetings with our client – maybe weekly, maybe daily, depending on the size of the project and the urgency. We will be interpreting their needs and their requirements, and translating that into communication with the crowd, which might be weekly newsletters, daily updates, or it might be through e-mail or a variety of communication channels."

In Harwood's opinion, regular contact with clients helps better understand their needs and requirements and communicate them to external professionals using an appropriate communication mode. He also notes that it is important to stay responsive to what is happening in the crowd and to address the needs and concerns of individual crowd members so that collective work results are not compromised. Harwood thus suggests that knowledge sharing / information exchange during crowd-based projects can be facilitated if the needs and interests of all parties involved are taken into account. As Woolley et al. (2015) observe, a mismatch between group goals and individual goals decreases the level of cooperation within the group. In the case of crowd-based projects, this means that if collective goals set by project managers do not correspond to the goals of individual crowd members, their interest in cooperation declines.

To increase the efficiency of information exchange between firms and the crowd, various mechanisms that help structure communication on the platforms are used. Those mechanisms should be seen as elements of interface design, which Kornberger (2016) considers one of the key design mechanisms in distributed innovation systems. He explains that the main purpose of interface design is to structure access to and the exchange of information within a network (mediating function). A well-designed system interface thus seems to be a prerequisite for building an 'efficient system of distribution and access to knowledge', which boosts innovative potential, to refer to David and Foray (1995).

Several mechanisms are used to structure communication on the Imaginatik platform. As Welborn explains, one option is to send out automatic alerts to everyone involved or potentially interested in a project in order to attract more interest and engagement in co-innovation. There can also be used machine learning-based mechanisms which help monitor the behaviour of project participants, and can initiate transactions or interactions within the network through alerts like "A lot of people are talking about this. What about this?" Welborn also mentions that communication can be structured by data visualizations. Since people consume information differently, in his opinion, information should be presented in various formats such as text, numbers or tag clouds so that it would appeal to and engage different types of people.

100%Open structures communication between client firms and the crowd by means of weekly newsletters, daily tweets and press releases. Special attention is given to weekly newsletters. As Katie Walsh, Lead Community Facilitator and Project Manager at 100%Open, explains, newsletters give community members relevant updates such as "[...] what's happened in the week, what's going to happen in the week, what they should be looking out for, who has really great ideas, who won which particular incentive or whatever". To reinforce a client's request, her team also writes comments and questions on the platform.

Although Imaginatik and 100%Open use different mechanisms to structure communication between their clients and external crowds, they seem to serve the same purpose: to engage crowd members in the co-innovation process and to facilitate the exchange of knowledge and information within the network. Both firms thus act as mediators of all interactions and co-innovation efforts on their platforms. By contrast, Spigit's clients have full managerial control of communication during crowd-based projects. As Morrison notes, "All we do is make sure that we give our client ideas and

examples". This approach could be interpreted as an attempt to increase the efficiency of information exchange between client firms and the crowd by fostering a culture of direct communication on the platform. Direct communication helps pass on messages more quickly, establish better contact with external professionals, avoid misunderstandings and faster address any problems that might occur during multi-party projects.

The efficiency of distribution and access to knowledge (David and Foray, 1995) in the context of crowdsourcing can be hindered by various communication challenges. In Harwood's opinion, communication challenges mainly concern managing the expectations of all parties involved in a project:

> "Communication challenges are just about managing expectations on all sides. A client wants to find the next billion dollar opportunity, and somebody in the community might just want some free Amazon gift vouchers. There are long-way paths of how you align the expectations on both sides of that relationship. It is possible, but it just requires frequent and valuable communication as appropriate."

Harwood notes that only through "frequent and valuable communication" the expectations of firms and the crowd can be aligned. Therefore, diverse expectations can only be managed effectively if there is a well-designed communications strategy. However, as Van de Ven (1986) observes, developing a strategy that facilitates innovation is still challenging.

Welborn thinks that knowledge sharing / information exchange on crowd-based innovation management platforms is often hindered by a lack of integration of those platforms into an enterprise resource planning (ERP) system, a knowledge management system (KMS), a customer relationship management (CRM) system or any other enterprise network. As a result, firms cannot utilize crowd potential "to dig into the challenge that comes from other sources". To avoid that, he recommends having application programming interfaces (APIs) which enable the integration of data from other enterprise applications: "Strengthening the relevance of all the applications working together – as they can feed each other and the data permeating them can feed each other – is clearly the direction we are all headed over the next few years anyway." This comment implies that the integration of crowd-based innovation management software into enterprise management systems can help extract more valuable data for the crowd to work on and contextualize them within a wider range of business operations, thus increasing the efficiency of distribution and access to knowledge dispersed in-house, to refer to David and Foray (1995).

According to Morrison, communication with the crowd is challenging because firms do not have direct access to people that they would like to participate in their open innovation challenges. To make his point clear, he refers to the case of the United Nations (UN), one of Spigit's clients:

> "We're working with the United Nations, and the United Nations uses our platform to run challenges, and they don't know who the people are that they would like to participate, they don't know their addresses. You have to hope that people will find out about it through just the general marketing that you do, or because they care about your brand or your company – they come to your website or whatever."

Morrison suggests that open innovation challenges can reach their target audience through the overall marketing and branding efforts of the organizations behind them. The reputation and market position built over the years can determine the success of finding co-innovators within one's brand community. Morrison also stresses that it is important to formulate a challenge that will resonate with one's target audience: "I think that the main thing is if you ask a question and present a challenge that people care about, it's more likely they'll find it than if you ask a question or present a challenge that people don't care much about." Formulating a challenge that addresses the needs and interests of a specific group can motivate that group to get actively involved in co-innovation. That reflects the observation made by Woolley et al. (2015) that intrinsic motivation underlies online collaboration.

4.2 Crowd control vs. creative autonomy

Open innovation is often managed within 'creation nets', designed to harness the potential of collective intelligence dispersed outside enterprise boundaries (Brown and Hagel III, 2008). As Felin et al. (2017: 123–124) observe, "[...] the locus of knowledge and innovation increasingly is the network rather than the firm." To enhance their innovative capacity, firms use various mechanisms to coordinate co-innovation efforts within 'creation nets' (Brown and Hagel III, 2008). Paradoxically, a high level of team diversity that firms seek to tap into might bring infeasible solutions if the right crowd control mechanisms are not set (Page, 2007). However, any constraints on work style and methods can hinder intrinsic motivation and creativity (Amabile and Fisher, 2000) and, consequently, negatively affect team performance.

100%Open tries to control crowd behaviour by facilitating engagement and cooperation within communities built around innovation projects. Harwood believes that "friendly but directed

community facilitation" encourages co-innovation efforts, and thus acts as a crowd control mechanism:

> "You don't want to control the crowd too tightly, you want people to talk freely. A lot of the control comes from the very friendly but directed community facilitation that Katie [Katie Walsh, Lead Community Facilitator and Project Manager at 100%Open – Ed.] and her team will undertake: engaging people, asking them questions, trying to steer them in the right way, bringing people together to talk to each other. So a lot of that control is less around strict rules or technical control. It's more around trying to encourage the right behaviours. You can establish that in the early days of a community, then the community controls itself."

According to Harwood, the crowd can be controlled without having strict rules or technical control measures. Co-innovation efforts can be steered in a preferred direction by encouraging proper behaviour and allowing project participants to explore their ideas within the limits of project objectives. This approach reflects the observation made by Lakhani and Panetta (2007) that successful management of distributed innovation systems requires relinquishing strict control of the input of external professionals. It also follows Brabham's (2013) recommendation on sharing control of crowd-based creative production between outsourcing firms and the crowd. 100%Open encourages crowd self-control as long as co-innovation efforts meet project objectives. All interactions within project communities are closely monitored to ensure productive work.

If community facilitation efforts are not sufficient to control crowd behaviour, 100%Open uses the platform flagging system. Community facilitators led by Walsh flag users who misbehave in any way. Walsh stresses that her team also relies on community self-control: anybody in the community can flag a person whose comments or actions are disapproved. Once someone has been flagged for misbehaviour, Walsh's team considers what to do next:

> "We can send a private message usually using the platform. We can send them an e-mail directly. We can actually comment on the platform publicly. Quite often if they've missed an e-mail, that isn't terrible, we will just put another onto the platform. And then our ultimate sanction once they've been warned is to ban them from the platform. And that means letting the platform know that we've excommunicated them."

The range of crowd control mechanisms at Walsh's disposal allows her team to take proportionate measures to a user's misbehaviour. The prospect of being excommunicated from the community acts as a deterrent against misbehaving especially to individuals who seek to establish their professional reputation or to show their expertise within that community. Those individuals are intrinsically motivated to advance their career in a collaborative online context (Butler et al., 2007; Lakhani and Wolf, 2005; Lerner and Tirole, 2005), and thus try not to harm their reputation in any way.

Welborn believes that the crowd can control itself quite well if project objectives are clearly defined in advance. He mentions that various gamification techniques can be used to help project participants (re)focus on ideas which receive the highest approval within the group. On the Imaginatik platform, that approval is measured using the kudos ranking system, based on a weighted score. As Welborn explains, "In something that we call *kudos*, [...] a group of ideas may be seen as more effective according to different criteria you may set up. These are the ones that get recirculated among the group." The kudos ranking system is an example of evaluative infrastructure, which Kornberger (2016) sees as one of the key design mechanisms that structure distributed innovation systems. According to him, the main role of evaluative infrastructure is to categorize and hierarchize new products, ideas and experiences within those systems (valuation function), which in turn helps organize sense- and decision-making.

The kudos ranking system seeks to actively engage the crowd in the idea valuation process, to refer to Kornberger (2016). Its feedback is taken into consideration while making decisions on how to progress further. As Welborn explains, "There is nothing that generates more enthusiasm and excitement than seeing that what I contributed actually contributes to what it is that we are trying to do. That is interestingly an incredibly powerful source of nudging the crowd in an effective direction." Welborn thus links crowd self-control to the satisfaction that individual crowd members feel when their work is recognized as a valuable contribution to the project. In addition, the kudos evaluative infrastructure enables active crowd involvement in decision-making. Crowd members are empowered to propose ideas, evaluate the ideas of others and voice their concerns or reservations. That empowerment as well as the prospect of turning one's idea into a reality help boost engagement in co-innovation. As a result, the crowd is more motivated to stay focused on project goals and to achieve the best work results.

To control crowd behaviour, Spigit assigns moderators. As Morrison explains, the moderator's role is to ensure that all submitted ideas are relevant to the topic, to follow comments, to look for ideas that have not received a lot of comments and to connect people who have similar ideas so that they can collaborate. His team trains clients how to moderate group interactions on the platform. There are no restrictions on the number of moderators per project. As Morrison notes, "Multiple people, sometimes dozens of people, should be moderators." Each moderator helps ensure that all interactions within 'creation nets' (Brown and Hagel III, 2008) based on the Spigit platform are constructive. The

continuous moderation of co-innovation efforts aims to utilize the potential of collective intelligence dispersed outside enterprise boundaries, to refer to Brown and Hagel III (2008).

In addition, Spigit controls crowd behaviour through a pairwise voting structure, which allows project participants to vote anonymously on submitted ideas. This crowd voting scheme is another example of evaluative infrastructure, to refer to Kornberger (2016). It helps categorize and evaluate submitted ideas according to certain criteria, and brings ideas with the most crowd votes into managerial focus. Therefore, Spigit's pairwise voting system helps organize sense- and decision-making during crowd-based projects, to refer to Kornberger (2016), as is the case with Imaginatik's kudos ranking system.

To ensure that their crowd control mechanisms do not suppress crowd creativity, the platforms take various approaches. 100%Open intervenes in the ideation process only when there is no other option left. Harwood notes that even if some project participants criticize how the project is being managed, his team hears them out, and asks their advice on how to make things better. Walsh mentions that project participants often "post the bare bones or beginning of an idea". In such cases, her team tries to help them refine their ideas. In her opinion, "[...] that would prompt them to be a lot more creative about their idea and think in practical terms about it as well." This approach follows the recommendation of Minor et al. (2017) on encouraging project participants to critically evaluate if suggested ideas are worth implementing or to refine them. According to the scholars, these measures help boost engagement in co-innovation, and thus increase the ideation rate, which is the key success factor for innovation programmes run on crowd-based innovation management platforms. Therefore, 100%Open tries to facilitate crowd creativity by encouraging project participants to think critically and in practical terms about their ideas and the project itself. This approach requires stepping outside one's comfort zone: to think about one's idea differently and to challenge one's assumptions about what will work best in a given situation. If project participants are willing to do so, their engagement in co-innovation is likely to increase.

Creative autonomy on the Imaginatik platform is safeguarded with data visualizations. As Welborn explains, all content posted on the platform is processed through visual mechanisms, which help notice phenomena that might affect team performance and respond accordingly. For example, semantic analysis is used to identify if there are any fringe thinkers among project participants. Welborn

observes that despite sharing “extraordinary powerful” ideas, some of those fringe thinkers do not engage much in co-innovation. In such cases, his team reaches out to them to encourage them to develop their ideas further either individually or in a team. “The last thing you want from an innovation programme is to drive sameness. You really want to explore diversity and difference, which is why visual tools are so critical, I think,” Welborn notes. In this context, the use of visual tools to process crowd-generated content on the Imaginatik platform should be seen as an attempt to facilitate crowd diversity, which, according to Minor et al. (2017), determines the ideation rate and thus the success of any innovation programme run on crowd-based innovation management platforms. Groups with diverse expertise and cognitive abilities are more likely to ‘out-ideate’ homogeneous groups and, consequently, find non-standard solutions faster (Aggarwal and Woolley, 2012; Bonabeau, 2009; Minor et al., 2017). Imaginatik’s practice of language processing aims to engage individuals with diverse professional and cognitive skill sets in the ideation process, thus helping them explore their creative potential.

To prevent any action that might suppress crowd creativity, Spigit trains project moderators how to overcome their personal bias while monitoring crowd-generated content. Although groups tend to be more biased than individual decision makers (Kerr et al., 1996), Spigit takes precautionary measures against personal bias that might affect the moderator’s judgement on how to handle submitted ideas. Morrison also stresses that the platform technology can “[...] force every idea to be looked at an equal number of times in an anonymous way.” He believes that the technology combined with anti-bias training helps ensure that “[...] every idea gets a fair look, and every idea gets anonymous.” Not only does this approach facilitate creative autonomy, but it also addresses the problem of poor output quality, which occurs when all project participants do not have sufficient knowledge to make valuable contributions (Bonabeau, 2009). The consideration of all submitted ideas on equal terms and their anonymization allow project participants to freely express themselves and to voice their support for or reservations about any idea. Moreover, the anonymous voting scheme helps filter out contributions of poor quality without hurting anyone’s reputation or career in any way.

Results-driven management of ‘creation nets’ (Brown and Hagel III, 2006) requires long-term incentives that motivate project participants to make valuable contributions. Those incentives thus act as crowd control mechanisms as well: they aim to steer co-innovation efforts in a preferred direction in order to find innovative solutions to the issue at hand. Woolley et al. (2015) have found that intrinsic

motivation is essential in collaborative online contexts, often characterized by work autonomy. According to Hackman and Oldham (1976), work autonomy is one of the key characteristics most directly associated with intrinsic motivation. The direct link between work autonomy and intrinsic motivation suggests that creative potential in a collaborative online context can be unleashed if intrinsically motivated project participants are given enough freedom to explore their creative ideas.

Asked how the crowd is incentivized on the Spigit platform, Morrison gave a simple answer: "[...] the incentive structure depends on the type of challenge that's being run. But for the most challenges, recognition is the most important incentive that we find to be valid." Morrison thus confirms the importance of intrinsic motivation in a collaborative online context (Woolley et al., 2015) and its reliance on work autonomy (Hackman and Oldham, 1976). In order to gain professional recognition, project participants should be granted enough creative autonomy to explore different options and the opportunity to refine their solutions without any constraints on their work style and methods, thus strengthening their intrinsic motivation and creativity, to refer to Amabile and Fisher (2000).

Similarly, Walsh believes that there is no universal approach to crowd motivation: "It's a lot of different types of incentives, ranging from nothing to a large professional honorarium." In her opinion, the choice of incentives is determined by the work context. Harwood notes that the effectiveness of incentives used by 100%Open on behalf of its clients does not only depend on their monetary value:

> "The biggest incentive for a company rather than an individual isn't necessarily a $5,000 / $10,000 prize. It might be with Ford, for instance, the opportunity to pitch my business to Ford and the opportunity to work with Ford on a project, which may be, if successful, worth hundreds of thousands or even millions of dollars over a period of time. Just, with a big company, getting to talk to the right person is a very big incentive."

Harwood observes that the opportunity to pitch one's business and the prospect of establishing contact or even long-term cooperation with a large firm like Ford is a strong incentive to make a substantial contribution to its project. He thus acknowledges the role of intrinsic motivation in strengthening engagement in creative problem solving in a collaborative online setting, to refer to Woolley et al. (2015). Realizing the business potential of the project, some participants will be more motivated to find innovative solutions to the firm's problem. Their creative explorations can be facilitated by granting work autonomy, to refer to Hackman and Oldham (1976).

Imaginatik advocates the use of non-monetary incentives during open innovation projects. Welborn believes that all incentives used to motivate the crowd should be based on the give-and-get principle:

> "People are motivated if it helps them. It's the give-and-get principle: if I give you something, I need to get something in return. It doesn't have to be money. It could be a connection. It could be an insight. It could be a surprise. It could be more knowledge. It could be something that helps me in my personal life. It could be something that helps in my professional life. [...] It all comes down to understanding what is in it for them either today or another time: What's that currency of exchange that engages them today that they may be calling on tomorrow?"

Welborn perceives the effectiveness of incentives in terms of their exchange value: in order to incentivize active participation in co-innovation, project participants need to know that their efforts will yield desired outcomes in the future. If the prospect of a valuable connection, knowledge or any other benefit that the project can bring to their personal or professional life can motivate them at least as much as the promise of a solid financial reward, they will put a lot of effort to find the best solution to the issue at hand. Imaginatik thus also supports the view held by Woolley et al. (2015) that intrinsic motivation is essential in a collaborative online setting. Welborn's observation that the effectiveness of non-monetary incentives is determined by their exchange value suggests that intrinsically motivated project participants can make more valuable contributions to the project if they are granted work autonomy, to refer to Hackman and Oldham (1976), so that they can explore their creative potential with their own agenda in mind.

4.3 Intellectual property (IP) protection

The open innovation model advocates relinquishing strict control of IP on which innovative solutions could be built (Chesbrough, 2003a; Chesbrough et al., 2006; Geerts, 2009; Lakhani and Panetta, 2007). To exploit the innovative potential of external professionals with diverse expertise, firms need to ensure that their IP policies facilitate knowledge exchange between all parties involved in an open innovation project, regardless of their professional affiliation. Since there is no single standard on how much openness IP policies should support, firms need to carefully consider what degree of openness will work best in a given context (Lakhani and Panetta, 2007). In each case, they need to decide how much they should open up their innovation process to third parties and how to protect their IP from unauthorized use (Lee et al., 2010).

The open innovation model assumes that innovation can be managed effectively in innovation ecosystems, where innovative ideas flow freely across enterprise boundaries until they reach firms

which are willing to explore them further (Geerts, 2009; Hall, 2010). In this context, the crowd-based innovation management platforms act as mediators of knowledge exchange between external professionals with sought-after expertise and firms which would like to commercialize their innovative ideas and build exceptional intellectual capital on top of them in order to gain a competitive advantage. However, their approaches to the mediation of knowledge exchange and IP management during open innovation projects differ.

As Harwood explains, the default approach to IP at 100%Open is that innovators own IP that they have created. If there is a more sensitive commercial or technical issue, 100%Open sets up a mechanism called an *innovation airlock:* it signs a confidentiality agreement with its client, and once it finds suitable people in the crowd for the project, it signs a separate confidentiality agreement with them. Over the next 8–12 weeks, the selected professionals develop their innovative ideas. Then they are given the opportunity to pitch their solutions to the client. The client has 90 days to decide whether he/she wants to apply any solution. Otherwise, the innovators retain their IP rights.

Harwood notes that the innovation airlock prevents *intellectual property (IP) contamination*, i.e. the unauthorized use of any IP owned by third parties, which often occurs when innovation is built on existing content (de Beer et al., 2017). The innovation airlock grants legal protection for all commercially sensitive information, and facilitates a constructive exchange of relevant knowledge, to refer to Lakhani and Panetta (2007). In Harwood's opinion, it also creates a safe space for co-creation as it controls the number of people who can see each other's ideas. That in turn balances creative explorations of IP relevant to the project with safeguards against the unauthorized use of anyone's IP. This IP protection mechanism prioritizes the exchange and creative (re)use of existing knowledge over strict control of access to it, to refer to Lakhani and Panetta (2007). It also reflects a shifting attitude to IP protection: IP used in the co-innovation process is perceived as a tradable good in innovation ecosystems (Gassmann et al., 2010). To put it simply, all parties involved in an open innovation project trade their expertise with each other or look for more beneficial IP trade opportunities elsewhere.

By contrast, Imaginatik's IP policy is that its clients own IP created during open innovation challenges. As Welborn explains, the innovation management software is run in a cloud-based "multi-tenant environment with lots of security provisions" in order to protect user IP from unauthorized use. He notes that there are different tiers of IP: "For example, joint challenges that result in revenue can be

put into an escrow account and distributed according to a tiered IP distribution." He also observes that in some cases, external professionals show little interest in retaining their IP rights or getting compensated for their intellectual input. They are more interested in non-monetary forms of compensation such as prestige, reputation or visibility. In each case, Imaginatik needs to carefully consider what degree of openness will work best, to refer to Lakhani and Panetta (2007): it needs to decide what approach to IP management will help achieve project goals more efficiently and how to balance the interests of all parties involved in the project. That inevitably raises the question of how much information transparency an IP strategy should support in a given situation.

Spigit's approach to IP management is that it reinforces the IP policy of its clients. Morrison notes that there is no one-size-fits-all approach. He mentions that most of Spigit's clients ask external professionals to sign an IP transfer agreement, in which they agree to transfer all ownership rights to IP that they have created to the firm. Some clients require external innovators to share their IP, while others allow them to retain their IP rights. The choice of an IP strategy depends on a client's innovation needs and the type of open innovation challenge. To protect client IP, Spigit's cloud-based software as a service (SaaS) solution provides a security protocol that clients can audit. It also ensures compliance with the General Data Protection Regulation (GDPR). Therefore, Spigit's approach to IP management grants clients full control of their innovation process: they decide what degree of openness their IP strategy should support in a given context, to refer to Lakhani and Panetta (2007). Morrison stresses that his team wants to ensure that its "[...] clients have the options that work for them." Spigit thus mediates knowledge exchange on its platform, to refer to Lakhani and Panetta (2007), in whichever form its clients prefer.

5 DISCUSSION

The analysis of managerial approaches to knowledge sharing / information exchange, crowd control and IP protection conducted in this study has presented different information management options during platform-based open innovation challenges. The dynamics of the open innovation process requires constant supervision of the effectiveness of the crowdsourcing work format and review of one's managerial strategy. Those information management options could thus serve as a point of reference for managers of diverse open innovation projects. In addition, the analysis has highlighted the complexity of eliciting, processing and utilizing crowdsourced information for business purposes. Constant changes in team composition during crowd-based innovation projects challenge the

coordination of the open innovation process. Project managers thus need to be aware of intense team dynamics in the context of crowdsourcing and be prepared to respond to any challenges that might occur in a timely manner. The observations made in this study could thus be used as guidelines while designing or implementing one's managerial strategy.

Open innovation management is a complex process. A small-scale format of this study has allowed focusing only on 3 open innovation management issues, i.e. (1) knowledge sharing / information exchange, (2) crowd control and (3) IP protection. Further research on open innovation management on crowd-based platforms could continue the analysis of the open innovation phenomenon by analyzing other aspects of crowdsourced information management. Due to difficulties in finding interviewees for this research project, only 4 platform management representatives were interviewed. To better access relevant data for new studies, it is important to raise awareness among open innovation practitioners about the importance of conducting more research in the field. In addition, further research could include a larger set of relevant theories in order to examine open innovation management practices from multiple perspectives. The juxtaposition of diverse theories would help further explore the internal and external mechanisms of open innovation. Moreover, it could better contextualize certain managerial decisions and provide a deeper understanding of challenges that those decisions might cause. That in turn could facilitate the search for case-specific solutions. Furthermore, it could provide a broader context for a discussion of new phenomena in the field of open innovation management.

The research focus of this study suggests looking for innovative approaches to open innovation management. For instance, one option is to open up the innovation management process itself: the crowd could be more actively involved in project decision-making through crowd voting schemes. Project managers could thus share control of work progress and the quality of collective output with external innovators. Crowd empowerment through active involvement in project management would help better utilize intellectual capital which resides outside enterprise boundaries, to refer to Lakhani and Panetta (2007), for one's organizational purposes. It would also better engage the crowd in the co-innovation process: sharing managerial control with external innovators would make them more engaged in the project. Designing such a co-management scheme would inevitably involve a lot of organizational challenges. Open innovation management practices would undergo so-called *networked disruption*: conventional managerial approaches would need to be either upgraded or completely

abolished. That could also prompt revisions of organizational design: traditional top-down command and control management would limit the ability of organizations to absorb external intellectual capital, which would negatively affect their competitiveness. Eventually, they would need to rely more on bottom-up managerial initiatives designed within the network of their business interests, thus opening up their management process.

6 CONCLUSIONS

In conclusion, the crowd-based innovation management platforms analyzed in this study take various approaches to knowledge sharing / information exchange, crowd control and IP protection. There is no one-size-fits-all approach: the network-based business model of the platforms determines the complexity of managing crowd-based innovation projects. The manager's main role is to effectively distribute problem solving among a large group of people, to refer to Goodrich (2013), and to balance the interests and professional agendas of all parties involved. Organizing teamwork in the context of crowdsourcing is challenging as levels of commitment to the project within the crowd can vary significantly. Consequently, managers need to carefully analyze the context before making any decision on how to handle different aspects of crowdsourced information management. They also need to explore their own creative potential in order to adequately respond to intense team dynamics during crowd-based innovation projects.

To facilitate knowledge sharing / information exchange between firms and the crowd (RQ1), the analyzed platforms take various approaches. Both Imaginatik and Spigit stress the importance of information / communication transparency during open innovation challenges. 100%Open tries to facilitate knowledge sharing / information exchange during co-innovation projects by balancing the needs and interests of all parties involved. The platforms structure project-related communications through different mechanisms. For example, Imaginatik uses various data visualizations so that project-relevant information would appeal to and engage different types of people. 100%Open structures communication between its clients and the crowd mainly through weekly newsletters, which synthesize community-relevant updates. Although Imaginatik and 100%Open use different mechanisms to structure project-related communications, they seem to serve the same purpose: to engage external innovators in co-innovation and to facilitate the exchange of knowledge and information within the network. Both firms thus act as mediators of all interactions and co-innovation efforts on their platforms. By contrast, Spigit's clients have full managerial control of project-related

communications. This approach could be seen as an attempt to increase the efficiency of information exchange between firms and external innovators by encouraging direct communication on the platform.

To strike a balance between crowd control and creative autonomy (RQ2), the platforms balance their crowd control mechanisms with crowd self-control. 100%Open tries to control crowd behaviour through community facilitation. It encourages crowd self-control as long as co-innovation efforts meet project objectives. It intervenes only when there is no other option left. Imaginatik balances managerial control with crowd self-control through its kudos ranking system: it uses the system to (re)focus the attention of project participants on ideas which receive the highest approval within the group. In addition, Imaginatik tries to safeguard the creative autonomy of external innovators by processing all crowd-generated content on its platform through visual mechanisms. This practice, for example, helps identify fringe thinkers who do not engage much in co-innovation despite their potential, and encourage them to develop their ideas further. Spigit tries to control crowd behaviour by assigning moderators of group interactions on the platform as well as through its pairwise voting system. This crowd voting scheme allows project participants to vote anonymously on submitted ideas, thus facilitating crowd self-control and involvement in decision-making, to refer to Kornberger (2016), as is the case with Imaginatik's kudos ranking system. To safeguard creative autonomy on its platform, Spigit trains moderators how to overcome their personal bias while monitoring crowd-generated content. In addition, the platform technology ensures that all submitted ideas are anonymized and looked at the same number of times, thus allowing considering them on equal terms.

To steer co-innovation efforts in a preferred direction, the platforms use a variety of incentives. Those incentives thus act as crowd control mechanisms as well. The platforms recognize the importance of intrinsic motivation and the role of non-monetary incentives in eliciting high-quality collective input during crowd-based innovation projects. They also acknowledge that intrinsically motivated external innovators should be granted enough work autonomy so that they could explore their creative potential and make valuable contributions to the project. This attitude reflects the observation made by Hackman and Oldham (1976) that there is a direct link between work autonomy and intrinsic motivation. It also follows Brabham's (2013) recommendation on sharing control of crowd-based creative production between outsourcing firms and the crowd: if intrinsically motivated external

professionals are given enough freedom to explore their creative ideas within the limits of project objectives, balancing crowd control and creative autonomy becomes a viable option (RQ2).

To protect firms' IP during their cooperation with the crowd (RQ3), the platforms use different IP protection mechanisms. In each case, firms also need to carefully consider how much they should open up their innovation process to third parties, as recommended by Lee et al. (2010), to control access to their IP. In addition, they should allow the platforms to balance their IP protection measures with their efforts to facilitate the exchange of relevant knowledge between all parties involved in co-innovation, to refer to Lakhani and Panetta (2007). If there is a more sensitive commercial or technical issue, 100%Open sets up a so-called *innovation airlock:* it signs a confidentiality agreement with its client and a separate confidentiality agreement with selected external professionals. This mechanism controls access to all commercially sensitive information during co-innovation projects, and facilitates a constructive exchange of relevant knowledge, to refer to Lakhani and Panetta (2007). To protect user IP from unauthorized use, Imaginatik's innovation management software provides a lot of data security features. It also gives the option to set up different tiers of IP: project revenue can be put into an escrow account and distributed among co-innovators according to a set-up IP distribution scheme once certain conditions are met. In each case, there is a need to decide how much information transparency an IP strategy should support. To protect client IP, Spigit's ideation management software provides a security protocol that clients can audit. It also ensures that client data are processed in accordance with the General Data Protection Regulation (GDPR). These data protection measures grant Spigit's clients full control of access to their commercially valuable data and IP during open innovation projects. In addition, their co-innovation preferences determine the format of knowledge exchange on the platform, to refer to Lakhani and Panetta (2007).

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