Creating Ideas for Innovation: Effects of Organizational Distance on Knowledge Creation Processes

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Innovation is to a large extent considered a social and communicative process, and input from other individuals potentially improves the generation of novel and valuable ideas also in the early stages of idea creation and development. Both colleagues inside organizations and external parties have frequently been proposed as important sources of information and knowledge within this part of the innovation process. Other contributions addressing social networks and innovation bring into focus the potentially negative effects that certain network structures may have on innovation, pointing to inconsistencies in received theory. In order to address these inconsistencies, an empirical study of ideation in a Swedish multinational firm was performed, taking into account two different knowledge creation processes – combination and in-depth analysis – and their inter-relationships with organizational distance between contributing individuals. Data was collected using a survey and was analysed using regression models. It was found that different levels of organizational distance correlate with different knowledge creation processes. In-depth analysis occurred more often with employees' close colleagues, whereas the combination of existing ideas and information was more frequent in interaction with employees' close colleagues and with external parties. Both these interaction patterns were also found to be positive for the generation of patents, whereas no such relationship could be seen when individuals interacted with colleagues in other departments in the same firm. The findings have implications for theory on cognitive distance, and also suggest that management needs to facilitate different types of collaboration and networking when aiming to facilitate and support ideation, taking into consideration the type of innovation aimed for, as well as its supporting knowledge creation processes.

Introduction

Idea generation is a fundamental activity in the early stages of innovation and the outcome of these early stages has a high impact on the costs of the later stages in the innovation process as well as the commercial performance of new products (see, e.g., Koen et al., 2001). Hence, the ability to create and develop ideas for innovation is highly important to firms, and many leading firms today are therefore attending actively to ideation, an activity that earlier was often assumed to take place spontaneously, or by simple mechanisms such as suggestion boxes. However, at present we are witnessing a radical change to the idea landscape (Sandström & Björk, 2010). First of all we note that innovation in most industries has become more multi-dimensional, no longer being only about product and process technology, driven by the R&D department or a dedicated innovation unit. Instead, innovation is manifested also in terms of, for instance, new services, markets, business models and organizational forms, and a consequence of this is that a wider range of employees throughout organizations can contribute significantly to the shaping of ideas that can be developed into innovations, i.e. some type of novel and valuable output such as new products, processes, services and businesses. However, in order to leverage the potential of the entire organizations' collective creativity, fundamentally changed ways of working with

10.1111/caim.12097

the generation and development of ideas are required. New systems and processes are therefore introduced, engaging more individuals and allowing for collaborative ideation work. These new approaches among other things allow employees to socialize and generate ideas together with their colleagues in a networked manner, something that has been found to benefit idea creation (Schulze & Hoegl, 2008; Björk & Magnusson, 2009).

For most firms the primary source of innovative ideas is the collective creativity of their employees, and internally created innovation opportunities account for about half of all innovation initiatives (Terwiesch & Ulrich, 2009). Nevertheless, the recent emphasis on Open innovation (Chesbrough, 2003) points to the innovation potential residing in idea sources outside the single firm, as well as in the information from external sources that can be used by employees in their creative efforts. Literature dealing with idea generation largely confirms that firms indeed benefit from having their employees socializing (see, e.g., Schulze & Hoegl, 2008) and generating ideas (see, e.g., von Hippel, 1988) with external actors.

From the above it is possible to see that interaction with both colleagues and external parties appears to be an important factor that firms need to address in their ideation activities. However, a question to which it is more difficult to get a clear answer is what type of networking is more fruitful. We here find diametrically opposed views in different literature streams. Whereas some point to network characteristics such as weak ties, loosely connected networks and structural holes (Burt, 2004) as positively influencing innovation, others highlight the benefits of strong ties and dense networks on innovation (Björk et al., 2011). In order to resolve this inconsistency, one possible way forward is to apply a more fine-grained view of the different types of innovation resulting. Hemphälä and Magnusson (2012) found that different network characteristics supported radical and incremental innovations, respectively, in different ways. Another possible focus that can help shed new light on the contradictions in existing theory may be to attend more carefully to the different sub-processes involved in innovation. For the overall innovation process, including both exploration and exploitation activities, it has been proposed by Kijkuit and van den Ende (2007) that different network structures are helpful in different parts of the innovation process. In the initial part of the innovation process, a larger number of looser, heterogeneous relationships are proposed to benefit innovation, whereas the execution part of innovation is furthered by a more limited number of closer and more cohesive relationships (Kijkuit & van den Ende, 2007).

Narrowing down the focus to the ideation process, it is not that clear, however, what specific network structures are actually beneficial. One possible reason for this is that we can actually distinguish two fundamental knowledge creation processes involved in ideation. On the one hand we find the knowledge creation process that is constituted by a combination of different sets of knowledge and information, and on the other hand the knowledge creation taking place through in-depth analysis within a specific knowledge domain. Previous works inform us that the suitable prerequisites for these different knowledge creation processes are fundamentally different, in particular with regard to heterogeneity (Perry-Smith & Shalley, 2003) and knowledge redundancy (van de Ven, 1986; Nonaka, 1994). These issues have been treated in, for example, the literature on absorptive capacity (Zahra & George, 2002) and optimal cognitive distance (Nooteboom, 2000). In the literature on absorptive capacity (see, e.g., Cohen & Levinthal, 1990; Zahra & George, 2002) a key argument is that a firm's knowledge base strongly influences its capacity to identify, acquire and absorb knowledge from external parties, thereby basically pointing to the importance of knowledge redundancy. This basic view is further developed with the introduction of the notion of optimal cognitive distance (Nooteboom, 2000), which addresses innovation in a more explicit manner. Nooteboom (2000) underlines the limited potential in relationships where the knowledge sets involved are too similar and therefore do not provide sufficient creative tension, as well as the difficulties to understand each other when there is insufficient overlap of knowledge. A contrasting view to this is found in the theory on communities of practice, where it is instead argued that the close relationships characterized by trust, mutual interest and shared knowledge (Wenger & Snyder, 2000) found in these networks create a suitable setting for innovation and learning (Brown & Duguid, 1991). Summarizing these to some extent conflicting views, it is easily seen that there is a need to investigate if and how the distance between individuals interacting with each other influences their ideation performance. This leads us to the purpose of this study, which is to explore how the organizational distance between individuals is inter-related with different types of knowledge creation processes, and how this influences ideation outcomes. An improved understanding of these questions would not only be a step towards resolving the theoretical contradictions presented, but would also inform us about the usefulness of different types of interaction patterns within and outside organizations.

The structure of the article is as follows. First we turn to a theoretical exposition of the areas of interest to this study, leading to the formulation of specific research questions. The research settings and the methods used are then described, followed by results and analysis. Finally, the findings of the study are discussed and their corresponding managerial implications are presented.

Theoretical Exposition

This section addresses a range of literature streams that have a clear bearing on the purpose mentioned above. The exposition starts with the area of ideation, which leads on to knowledge creation processes involved in ideation. Thereafter, the concepts of cognitive and organizational distance are introduced and clarified, followed by the formulation of research questions.

Ideation, Collaboration and Networking

A sufficient supply of ideas for new products, processes and businesses is a prerequisite for innovation and sustained performance. Based on this insight, many firms today try to take more active approaches to the generation and development of new innovation ideas, which in more recent years has often been referred to as ideation (see, e.g., Björk, Boccardelli & Magnusson, 2010). Instead of simply waiting for ideas to emerge spontaneously in the organization or to arrive from external sources, firms establish new roles, systems and processes to actively induce, support and manage the creative actions leading to a continuous flow of novel and valuable ideas that can be turned into innovations.

In particular, we see that the traditional suggestion boxes used in many companies have been exchanged for IT-based systems that allow for much more efficient and effective idea management (Sandström & Björk, 2010). A key feature of many of these systems are that they do not simply constitute virtual suggestion boxes with all the advantages that digital communication brings about, but that they also allow for radically improved possibilities to influence and support ideation. Management can direct ideation efforts to specific areas where there is a clear demand for new ideas (Björk, Karlsson & Magnusson, 2014), and motivate employees to contribute with their ideas by offering different incentives and rewards in idea campaigns and competitions (see, e.g., Bergendahl & Magnusson, 2014), or by taking ideation performance into account in formal evaluations. These systems also open up new possibilities to undertake ideation in a more collaborative and interactive way. Employees inside firms, and sometimes also external parties, can for instance comment on others' ideas, become inspired by them so that they come up with new insights, jointly develop and refine ideas by adding different types of information, and motivate each other by providing feedback and encouragement. Such collaborative approaches to innovation have received substantial support in innovation theory, where a more collective and interactive view of the innovation process over time has gained ground. Even though it is clear that new ideas emerge in the heads of individuals, social relationships have shown to be central to innovation (Leonard & Sensiper, 1998), knowledge creation (Nonaka, 1994; Nonaka & Takeuchi, 1995) and the creation of innovative ideas (e.g., Schulze & Hoegl, 2008). Collaborative approaches to ideation open up new opportunities for combining different types of knowledge sets, something that was reflected in the findings of Björk (2012), who observed that individuals spanning different knowledge domains had higher ideation performance than others. Also at a more general level, positive effects of increased networking on ideation have been seen in previous studies, in which central network positions have been found to correlate with the generation of high-quality ideas (Björk & Magnusson, 2009; Björk et al., 2011). However, there is still substantial inconsistency regarding certain important network features.

This inconsistency is clearly seen in works on innovation and network structures, where for a long time there has been a debate about the benefits and drawbacks of different network structures. In dense networks individuals have mutual interests, know each other well, have high levels of trust, and communication is simple as a result of shared beliefs, knowledge and language. These features are in many ways similar to what has been argued as particular strengths of communities of practice (Wenger & Snyder, 2000), which have been proposed as settings suitable for learning and innovation. It has also been found that dense networks provide fruitful ground for innovations (Coleman, 1990). Similar reasoning can be found in the seminal work on social capital by Nahapiet and Ghoshal (1998), who state that colleagues who trust each other and share competences and expertise are in more suitable positions to create value as they have greater openness towards each other, understand each other better, can more easily exchange tacit knowledge and show higher willingness to take risks.

However, on the other hand, looser networks have also been suggested to have certain characteristics that are conducive for innovation. Departing from the idea of weak ties (Granovetter, 1973), it can be argued that loose couplings between individuals lead to many new combinations, some of which may be fruitful in terms of innovation, for instance when knowledge about technologies is combined with knowledge about markets and customer needs, and the matching of these knowledge sets gives rise to new products and businesses. Hence, there is still little agreement about the precise interrelationship between network structures and innovation.

One possible reason behind the observed inconsistencies is that most of the studies in question have focused narrowly on structural characteristics of communication networks between employees, and how these characteristics support or hinder innovation activities. In order to move beyond the present paradoxical view, a way out could be to apply a more fine-grained perspective that takes into account the specificity of different types of innovation and different sub-processes of innovation. One example of such an attempt is the work by Hemphälä and Magnusson (2012), who showed that different types of network ties supported radical and incremental types of innovation outcome, respectively. However, what has not been investigated to any substantial extent in the existing literature is how different levels of organizational distance influence different knowledge creation processes taking place in ideation.

Knowledge Creation in Ideation

In the literature on knowledge creation and learning, the distinction between exploration and exploitation activities pointed out in March's (1991) seminal article has been thoroughly used. Katila and Ahuja (2002) argue that firms use and reuse existing knowledge in different ways. On the one hand firms can display different search depth, that is, the extent to which they reuse their existing knowledge. On the other hand, they can also differ in terms of search scope, the extent to which they explore new knowledge fields. This two-dimensional view of search behaviour can be seen as a development of March's continuum of exploration and exploitation and in this way provides a richer and more nuanced view of knowledge development (Katila & Ahuja, 2002). Applying such a multidimensional view on knowledge creation, it may be possible to discern potentially important differences at a more detailed level. In fact, when looking narrowly on the ideation process, which in terms of exploration and exploitation has been regarded mainly as a matter of the former, it is possible to distinguish different types of knowledge creation processes. Building on the difference between search depth and search scope (Katila & Ahuja, 2002), two distinctively different knowledge creation processes can be discerned, both of which are arguably important for the creation and development of new innovation ideas. On the one hand we find the notion of knowledge creation as combination, where new creative insights and ideas emerge in the combination of different sets of knowledge. This view has a long tradition in the field of innovation, dating back to Schumpeter's (1934) definition of innovations as new combinations. Nonaka (1994) explicitly pointed out combination as a central knowledge creation process, and it has also been indicated that a high level of requisite variety is of great importance for innovation (van de Ven, 1986; Nonaka, 1994), as it allows components from heterogeneous knowledge sets to be joined together. This view is also reflected in the more specific literature on heterogeneity and its importance for innovation, pointed out by, for example, Cabrales et al. (2008). Moreover, we find similar thoughts in more fundamental works on creativity, such as Koestler's (1989) view that new knowledge emerges in the intersection of different knowledge planes, and that creative ideas emerge when two normally unrelated knowledge sets in this way cross-fertilize each other.

On the other hand, the process of knowledge creation arguably also takes place through analysis. As analysis is the task of decomposing something (materially or logically) into pieces in order to understand the inter-relationships between its parts, it is clear that this is qualitatively different from combination. This process is also highly relevant for finding new solutions to problems, as well as improving already existing solutions. In studies of innovation and product development, this specific knowledge creation process is sometimes discussed in terms of disciplined problem solving (Brown & Eisenhardt, 1995), and in more general terms it could be seen as the application of the traditional scientific approach, in which a key activity is the generation and test of hypotheses, something which requires a substantial amount of analysis. Whereas this view of knowledge creation in the scientific community is regarded as 'normal' science (Kuhn, 1962), it is surprisingly rarely mentioned in innovation studies. One reason for this may be that just as the lion's share of 'normal' science does not bring about any radical insights and new paradigms, the bulk of analysis undertaken in innovation processes leads only to more incremental improvements and may therefore not be as visible and frequently investigated as radical and breakthrough initiatives. Moreover, following the reasoning of Nonaka (1994) and Szulanski (1996), it can be argued that analysis is likely to include substantial tacit or 'sticky' components, as it is basically a question about understanding a product, process or system at a very detailed level. Both these characteristics point to a strong need for redundancy of knowledge (van de Ven, 1986; Nonaka, 1994), which is normally gained through joint work over extended periods of time.

Comparing these two different knowledge creation processes more closely, we also see that they appear to have different prerequisites in terms of what constitutes fruitful levels of heterogeneity. Whereas combination thrives when heterogeneity is high, in-depth analysis arguably requires higher levels of similarity and knowledge redundancy. Parallels to this can be drawn with the works of Boland and Tenkasi (1995), who distinguish between perspective making and perspective taking, and Hill and Levenhagen (1995), who use the notions of sensemaking and sensegiving. Another analogy to this reasoning can be found in the Human Resource Management and Knowledge Management literatures, in which the need for T-shaped competences has been argued (see, e.g., Hansen & von Oetinger, 2001). The possibility to make the different knowledge creation processes work is, however, not only a question about having access to individuals with diverse and specific knowledge sets, but also depends on how these persons interact with each other. Hence, individuals' interaction patterns are arguably an influencing factor in knowledge creation processes.

Organizational Distance and Ideation

As mentioned above, a factor that has been suggested to condition the possibility to derive knowledge and related benefits from external information and knowledge is absorptive capacity. The initial view of this capacity was simply that the more knowledge an organization holds, the higher its potential to identify and absorb relevant knowledge from the outside (Cohen & Levinthal, 1990). This was later developed further by Zahra and George (2002) who suggested that similarities in knowledge facilitate absorption of new knowledge from external parties, but also underlined the difficulties related to putting the externally sourced knowledge to good use, e.g. through innovations. Poetz and Schreier (2012) showed that external ideas derived from crowdsourcing are normally more novel than the ones stemming from inside organizations, but this could, on the other hand, imply that they are also more difficult to implement. Hence, the distance between individuals' different knowledge sets stands out as an important aspect that influences what knowledge creation takes place as a result of these individuals' interactions. In this study, this is captured in terms of organizational distance, where individuals in different organizations are assumed to hold different knowledge sets and values, just as employees in different departments inside one and the same company accumulate different types of knowledge and come to resemble different parts of their external environment (Lawrence & Lorsch, 1967). Following this logic it is proposed that organizational distance increases when moving from colleagues working in the same group to individuals working in different firms, with employees working in different parts of one and the same company situated in between those extremes.

Another concept that is directly related to the possibility to benefit from bringing together different knowledge domains is cognitive distance (Nooteboom, 2000; Wuyts et al., 2005; Nooteboom et al., 2007). Nooteboom et al. (2007) suggest that the ideal situation for innovation to take place is when there is optimal cognitive distance between the parties involved, meaning that there is enough similarity in the cognitive structures for the parties to understand each other well, but at the same time enough difference to allow for bringing new knowledge and information to the other parties, and for challenging each other's perspectives and ideas. This theory was empirically tested by Wuyts et al. (2005), who found that cognitive distance influenced learning between firms, and that the effects of organizational and technological cognitive distances, respectively, were different in different industries and that this was related to the phase of development in the industries as well as the systemic aspects of innovation. What should be noted in these previous studies of cognitive distance is that a distinction is made regarding the type of knowledge involved (organizational or technological), but that no distinction is made between different knowledge creation processes, something which is understandable given that these studies have focused on the more aggregated organizational level rather than the individual one.

The importance of cognitive distance is particularly interesting with respect to the present emphasis on Open innovation (see, e.g., Chesbrough, 2003; Dahlander & Gann, 2010; Laursen & Salter, 2006). Despite a few critical works (see, e.g., Trott & Hartmann, 2009) the literature on Open innovation primarily underlines the potential benefits that can be gained from including external parties in the innovation process. Chesbrough (2003), for instance, suggests that firms that are too internally focused are prone to miss a number of opportunities as many of these will fall outside the organizations' current business areas or will need to be combined with external technologies to unlock their potential. Indeed, several studies reveal that creative work with colleagues from outside the focal unit can have a positive influence on ideation performance as it provides individuals with an opportunity to see a problem or task from an alternative perspective, which can stimulate creativity and innovation (Hargadon & Sutton, 1997; Hansen 1999; Perry-Smith, 2006). It has also been found that firms can benefit from having their employees generate ideas with, for instance, lead users, suppliers and universities (von Hippel, 1988; Laursen & Salter, 2006). Spanjol, Qualls and Rosa (2011) showed that there is a significant positive correlation between a firm's market search behaviour and its ideation volume (i.e., how many ideas they produce). Rosenkopf and Nerkar (2001) presented similar results, revealing that search processes that do not span over organizational boundaries generate lower effects on subsequent technological evolution. This research is to a large extent in line with the main overall view put forward in the literature on Open innovation, underlining that idea generation with external actors has a positive impact on ideation performance.

Even so, there is still a shortage of empirical research investigating the real effects gained from higher levels of openness in innovation, and then in particular studies investigating the specific effects of idea generation with external actors in relation to idea generation with colleagues. With respect to ideation, Open innovation brings about two important benefits related to ideas. First of all, Open innovation opens up opportunities to receive ideas directly from external parties, for instance from inventors, users, suppliers and customers. Another benefit is the information that can be gained in interaction with these actors, as their input gives rise to new ideas of the firm's own employees. These direct and indirect ideation inputs from external parties both constitute an interesting potential value, the size of which most likely varies between industries. On the negative side we find issues related to intellectual property rights, which may render external input difficult to handle. Based on the above, we also see that there may be a potential issue in terms of cognitive distance when interacting across organizational boundaries in ideation, both when involving external parties and when interacting with other internal functions and departments. However, we should here also underline that there may be different possible effects on different knowledge creation processes. Taken together, there is a need for more knowledge about the interrelationships between organizational distance and ideation, and then in relation to different knowledge creation processes. This leads us to the formulation of two specific research questions for our study.

RQ1: What relationships exist between the organizational distance between individuals engaged in ideation and their resulting ideation outcome?

RQ2: How is the organizational distance between individuals collaborating with each other in ideation inter-related with their knowledge creation behaviours?

We will now turn to a brief description of the methods used to investigate these questions, covering the research setting, variables and data collection and analysis.

Methods

Given the research questions listed above, it was decided to use a survey to explore them. This allows for the detailed analysis needed to explore the interaction between the organizational distances, the resulting innovation outcome and the inter-related knowledge creation behaviour. A survey was designed by the authors focusing on ideation management in general and the components and processes of knowledge creation in ideation in particular. Table 1 presents the variables used for this analysis as well as the corresponding research question. The questions used have incorporated a Likert-type scale ranging from one to seven.

The survey was run at a multinational firm, active within consumer goods, selected based on its long history of working actively with ideation management and its willingness to grant good access to the researchers to potentially sensitive information. Altogether, 450 people employed in the company's central division, working with marketing, product development, laboratories, research and business intelligence were included. The division

Table 1. Variables and their Corresponding Survey Questions

Variables, Name and Use	Survey Question	Used for RQ:
Dependent variable		
Patents	In how many patents or patent applications (within your firm) have you been inventor or co-inventor in the last 12 months?	RQ1
In-depth Analysis	I come up with new ideas by analysing problems in depth.	RQ2
Combination	I come up with new ideas by combining existing ideas and information.	RQ2
Independent variable		
Own group	How often do you generate ideas together with: your group?	RQ1, RQ2
Other Departments	How often do you generate ideas together with: people from other departments in your company?	RQ1, RQ2
Externals	How often do you generate ideas together with: people from outside your company?	RQ1, RQ2
Control variable		
Age	My age is:	RQ1, RQ2
Educational level	My highest level of education is:	RQ1, RQ2
Tenure	I have held my position:	RQ1, RQ2
Gender	My gender is: Female/Male	RQ1, RQ2
Product developer, Specialist, Line manager, Project manager, Other position	My position is:	RQ1, RQ2

is organized according to product categories where each category has its own units of product development, business intelligence and marketing. The division is responsible for the company's brands as well as the technical development of the products. The vast majority of the central division is situated in one common building and the majority of its employees have a high formal education level. Based on internal investigations, the company culture is reported as open and helpful with low power distance. Moreover, it should be underlined that the division of the company where the investigation took place is organized in groups that do not span geographical boundaries and consequently the possible influence of national culture ought to be limited.

The survey was distributed to the division in June 2012 through personal invitation e-mails that were signed off by the division's vice president and distributed to all 450 employees. The survey was run for a duration of three weeks with a reminder e-mail sent out after two weeks. When closing the survey, a total of 234 persons had participated giving a response rate of 52 per cent.

Data from the survey were analysed using regression modelling in Stata statistical software. Two regression models were designed to investigate the correlations of the control variables and the independent variables with the three dependent variables. The first model (Model I) captures the effect from the control variables only, whereas the second model (Model II) includes both control and independent variables. As we deploy three different dependent variables, each model is run three times (once per dependent variable). The variables included and their corresponding survey questions are hereafter presented briefly.

To secure the observed correlations to actually refer to the independent variables, a number of control variables have been included. The respondents' age, educational level, tenure and gender are included, as these could be argued to influence ideation performance. Furthermore, the working position for each respondent has been included as different positions could include different prerequisites for idea generation (especially regarding ideas potentially leading to patents).

The first dependent variable is called 'Patents' and is used to answer RQ1. The number of patents granted is thereby used to measure the innovation outcome per individual. One third of all the respondents reported to have generated one or more patents in the last 12 months. The second and third dependent variables, 'In-depth Analysis' and 'Combination', are used to capture the knowledge creation behaviour of each respondent and are correspondingly used to answer RQ2.

As described earlier, to analyse something is a matter of decomposing it into pieces in order to understand the inter-relationships between its parts. This specific knowledge creation process is sometimes discussed in terms of disciplined problem solving (Brown & Eisenhardt, 1995) and can in more general terms be seen as the application of the traditional scientific approach regarded as 'normal science' (Kuhn, 1962). The In-depth Analysis variable is correspondingly used to measure the behaviour of creating new knowledge by analysing problems in-depth. As presented in the exposition of theory, Nonaka (1994) points out the importance of combination as the source of the knowledge creation process and Schumpeter (1934) actually defines innovation as the new combination of existing solutions. The Combination variable is accordingly used as to capture the behaviour of creating new knowledge by combining existing information and ideas.

The independent variables used measure how often respondents have generated ideas together with individuals in different groups in their surroundings. The generation of ideas is here, as well as in the survey, defined as the starting point for possible future innovations. The specific questions were formulated as 'How often do you generate ideas with: Your own group, Other departments, and People from outside your company' and were measured as pre-determined frequency spans. Given this, these questions allow for analysis not only of frequencies but also of distances, as the three groups represent different levels of organizational distance. 'Your own group' is defined as the people that share the same line manager as the respondent; 'Other departments' are departments that the respondent's group does not belong to; 'Outside your company' refers to companies outside the company where the respondent is employed.

Results and Analysis

The results from the analysis using regression models in Stata are presented in Tables 2–5. First we present a correlation matrix for all the included dependent and independent variables, whereafter the regression results are presented one by one. For each specific regression result, a brief analysis is presented.

The correlations between the dependent and the independent variables are listed in Table 2, including correlation coefficients and significance levels. We note that a relationship exists between the examined organizational distance variables and the innovation outcome, but also that the organizational distance variables are correlated with each other. This correlation can to some extent be explained by individuals who to a substantial level are working together with colleagues in their own group and with employees in other departments, as well as with people from outside the

Table 2. Correlation Matrix of Dependent and Independent Variables (Coefficients and Significance Levels)

	Patents	Combination	In-depth Analysis	Own Group	Other Dep.	Externals
Patents	1.0000					
Combination	0.2100*	1.0000				
	0.0029					
In-depth Analysis	0.1978*	0.4275*	1.0000			
	0.0051	0.0000				
Own Group	0.1746*	0.3795*	0.2549*	1.0000		
	0.0146	0.0000	0.0004			
Other Dep.	0.0327	0.2542*	0.1781*	0.3654*	1.0000	
	0.6529	0.0005	0.0150	0.0000		
Externals	0.1668*	0.3274*	0.1622*	0.3187*	0.4614*	1.0000
	0.0218	0.0000	0.0278	0.0000	0.0000	

company. The organizational distance variables are therefore still regarded as valid for explaining innovation output and the knowledge creation behaviour.

Table 3 presents the results from the regression analysis of the number of patents generated in the last 12 months (Patents). The results indicate how the ideation output, in terms of number of patents generated, is inter-related with different organizational distances.

The results from regression model I show that the control variables contribute in a statistically significant way ($F(9,161) = 2.95$, $p < 0.01$), explaining 14 per cent of the variance of the dependent variable Patents. Regression model II for Patents includes both the control variables and the organizational distance variables and the results indicate that model II is statistically significant ($F(12,143) = 2.45$, $p = 0.0062$), explaining 17 per cent of the variance. The results reveal the level of idea generation 'with your own group' to be statistically significant ($\beta = 0.10$, $p = 0.08$) and positively contributing to the number of patents generated. It is also seen that the level of idea generation with 'people from outside your company' ($\beta = 0.10$, $p = 0.124$) is positively contributing to the number of patents generated, although one must be careful in drawing too strong conclusions given the relatively low level of significance.

Table 3. Regression Results for Patents

Performance Variable: Patents	Model I	Model II
Control variables		
Age	0.0357	0.0309
Educational level	0.1026	0.0754
Tenure	0.0244	0.0510
Gender	–0.4674**	–0.3835*
Product Developer	0.1638	0.0077
Specialist	0.0123	–0.0208
Line Manager	–0.2789	–0.3703
Project Manager	0.8387	0.7571
Other Position	–0.4998	–0.5943
Independent variables		
Own Group		0.1015†
Other Departments		–0.0897
Externals		0.0996
R^2	0.1415	0.1705
Ad. R^2	0.0935	0.1009
F	2.95**	2.45*

†$p \leq 0.10$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

That the frequency with which individuals generate ideas together with their own groups has a positive correlation with their number of patents generated appears logical. It is also in line with earlier studies showing that individuals who have many direct network ties to colleagues have higher ideation performance, at least up to a certain level of connectedness (Björk & Magnusson, 2009). However, the correlation found between the number of patents and the frequency of idea generation with externals calls for further explanation. One possible reason for this could be that there is a higher degree of novelty when generating ideas together with external parties. Higher novelty through external idea generation would then correspond to a positive effect in terms of the number of patents granted. Another possible explanation is that the involvement of external parties implies a clearer need to patent, either in order to make the generated knowledge more difficult to access and use in other firms, or by creating a clear intellectual property platform for further joint work.

The negative coefficient for idea generation with other departments is despite its non-significant level worth reflecting on. If idea generation with other departments does not actually result in patents, we need to ask whether this type of interaction is qualitatively different from the other types of organizational distance within idea generation that are investigated. One explanation of the missing inter-relationship could be that the idea generating activities run together with other departments are of a different character and with a different target, more likely of a more incremental character and with more of a short-term problem-solving target.

Taken together, the results regarding organizational distance and ideation performance in terms of patents highlight that there may be good grounds for the often argued benefits of Open innovation (e.g., Chesbrough, 2003; Laursen & Salter, 2006), and that firms may have good reasons to investigate this particular innovation potential. The surprising lack of ideation resulting from cross-departmental interaction also needs to be mentioned, as it first of all is not in line with previous studies, such as the one by Björk (2012), in which it was found that so-called knowledge domain spanners had higher ideation performance than others. Moreover, the absence of ideation benefits from increased functional heterogeneity presents a contrast to earlier studies on networks and creativity (Perry-Smith & Shalley, 2003; Perry-Smith, 2006). The observations instead underscore that there may be a potential negative influence of heterogeneity on creativity and innovation, as suggested by Milliken and Martins (2006).

Table 4 presents the regression results for the dependent variable 'In-depth Analysis'. The results reveal both model I ($F(9,161) = 1.78$, $p = 0.076$) and model II ($F(12,143) = 1.68$, $p = 0.076$) to be statistically significant. In model II the control variable 'Gender' ($\beta = -0.48$, $p = 0.082$) emerges as significant, and the variable accounting for how often individuals generate ideas with others in their own group ($\beta = 0.15$, $p = 0.088$) turns out to be positively and significantly influencing this type of knowledge creation process. A plausible interpretation of this is that the more one generates ideas together with one's own group, the more likely it is that one generates ideas by analysing problems in-depth. This is very much in line with existing theory on knowledge creation, which points to the importance of knowledge redundancy (van de Ven, 1986; Nonaka, 1994; Nonaka & Takeuchi, 1995) and shared understanding for joint problem solving.

Regarding the regression results referring to the variables 'Other Departments' and 'Externals', it is interesting that there is a trend towards less in-depth analysis in idea generation the greater the organizational distance. It should be stressed that the two variables in question are not found to be statistically significant but, in combination with the observed effect of in-depth analysis in individuals' own groups, it would seem logical that there is an inverted relationship between this type of knowledge creation behaviour and the organizational distance separating individuals generating ideas. When the organizational distance increases, the probability that the involved parties have substantial shared knowledge is reduced, and this makes knowledge creation in terms of in-depth analysis more difficult to undertake.

Table 5 presents the regression results for the dependent variable 'Combination'. The results reveal both model I ($F(9,161) = 2.08$, $p = 0.034$) and model II ($F(12,143) = 3.26$, $p = 0.0004$) to be statistically significant. The results from model II indicate that the variable representing how often individuals generate ideas with colleagues in their own groups ($\beta = 0.26$, $p = 0.003$), and the variable measuring idea generation frequency with people from outside the company ($\beta = 0.21$, $p = 0.028$) to be significantly and positively inter-related with knowledge creation through combination. This reveals that the more individuals generate ideas together with their own groups and with people from outside the company, the more likely it is that they generate ideas by combining existing sets of ideas and informa-

Table 4. Regression Results for In-Depth Analysis

Performance Variable: In-depth Analysis	**Model I**	**Model II**
Control variables		
Age	0.0172	0.0373
Educational level	–0.1062	–0.1485
Tenure	0.0121	0.1437
Gender	–0.7131*	–0.4834†
Product Developer	1.6757	1.1040
Specialist	0.8388	0.6027
Line Manager	0.7443	0.4834
Project Manager	1.5887	1.1666
Other Position	0.9159	0.5637
Independent variables		
Own Group		0.1537†
Other Departments		0.0847
Externals		0.0267
R^2	0.0904	0.1238
Ad. R^2	0.0395	0.0502
F	1.78†	1.68†

†$p \le 0.10$, *$p \le 0.05$, **$p \le 0.01$, ***$p \le 0.001$

Table 5. Regression Results for Combination

Performance Variable: Combination	**Model I**	**Model II**
Control variables		
Age	0.0852	0.1047
Educational level	0.0115	–0.0201
Tenure	–0.0747	0.0503
Gender	–0.8294*	–0.4164
Product Developer	1.1964	0.4775
Specialist	0.5192	0.1844
Line Manager	0.8205	0.2750
Project Manager	1.2467	0.6708
Other Position	0.1922	0.0809
Independent variables		
Own Group		0.2572**
Other Departments		0.0489
Externals		0.2093*
R^2	0.1043	0.2148
Ad. R^2	0.0543	0.1489
F	2.08*	3.26***

†$p \le 0.10$, *$p \le 0.05$, **$p \le 0.01$, ***$p \le 0.001$

tion. This could possibly be explained by high frequency levels of idea generation with one's own group and by a high level of novelty induced from the idea generation activities with people from outside one's company, respectively. The observed results for the idea generation levels with other departments is more difficult to explain as this interaction also ought to hold a fair possibility for combining different sets of knowledge, for example regarding technologies and markets. Nevertheless, in the investigated setting this does not seem to take place to any great extent. These findings challenge the by now well-established idea of cross-functional integration (Brown & Eisenhardt, 1995), at least in the particular setting that ideation constitutes.

Discussion

In this section, we first discuss the main findings of the study and their implications for theory. Thereafter, a number of managerial implications are derived, followed by some notes on the limitations of the performed investigation and suggestions for future research.

Although it is, of course, difficult to draw any far-reaching conclusions based on an exploratory study of this kind, using a variety of different literature streams and a survey with self-reported data, a number of interesting observations can nevertheless be made. Recently, we have witnessed a movement towards more fine-grained analyses of innovation in order to understand and resolve inconsistencies between different literature streams. A clear example of this is the effects of different types of network ties for different types of innovation outcomes, as described by Hemphälä and Magnusson (2012). Whereas more radical innovations are furthered by weak ties, incremental innovations instead seem to benefit from stronger ties. Similar ideas have been suggested by Kijkuit and van den Ende (2007), who instead of innovation outcomes address the different stages of the innovation process, and the related differences in terms of supporting social network structures. Hence, many of the investigated aspects appear to have both potentially positive and potentially negative effects, depending on the chosen outcome variable studied. Similar arguments are put forward by Hansen et al. (2005), who investigated how networks influence knowledge sharing and found that it is necessary to take into account both different phases of knowledge transfer and multiple networks. Also at a higher level of abstraction we can see this issue in the long-standing debate on the importance of structural holes for innovation (see, e.g., Coleman, 1990; Burt, 2004; Obstfeld, 2005), where it should be noted that the way innovation is operationalized and measured actually varies substantially. Hence, what may be positive for one aspect or sub-process of innovation could very well be negative for another aspect (Ahuja, 2000), an observation that in the light of March's (1991) dichotomy of exploration and exploitation appears most reasonable. However, just like Katila and Ahuja (2002), we find that it is in fact necessary to apply more fine-grained analyses in order not to arrive at overly simplistic conclusions. This implies that there is a need for more careful considerations regarding the choice of dependent variables. Given this, we regard the proposed distinction between different knowledge creation processes, i.e. combination and in-depth analysis, as novel and potentially fruitful for understanding the composed process of ideation in a more nuanced and detailed way.

From the empirical observations we noted that ideation performance in terms of patents was positively correlated with networking with external parties as well as networking with people in one's own group. With respect to the recently developed concept of cognitive distance (Nooteboom, 2000; Nooteboom et al., 2007), these results are somewhat surprising, in particular if we also note that networking with people from other departments had a negative (although not statistically significant) inter-relationship with patenting. Given the lack of detail in the study regarding the type of interaction that actually took place, and the sole use of patents as ideation output variable, no extensive conclusions should be drawn from this finding. However, it highlights the need to use a multi-dimensional measure of cognitive distance, not only focusing on geographical and organizational distance, but also including other dimensions such as technology. In a test of the theory on cognitive distance, Wuyts et al. (2005) point to the relative importance of organizational and technological distance in different settings. Based on our observations, the relative importance of these dimensions of distance may depend on the type of outcome that is referred to, both in terms of learning and innovation, and whether this outcome is of a radical or incremental nature. A possible explanation for the observed differences in terms of patenting can be that external parties in many ways may be less distant than colleagues in other departments, in terms of the type of knowledge they hold and the innovation activities they are engaged in. Poetz and Prügl (2010) highlight this in terms of the importance of analogous domains, as these provide fertile ground for creativity, given the absence of functional fixedness. Moreover, it could be that engineers and scientists inside a firm can communicate about innovations in a straightforward and fruitful way with researchers in other firms or in universities, whereas it can be highly problematic for them to engage in discussions with customers or users of the firm's products and services.

Another possible explanation is that the choice of patents as our dependent variable delimits the ideas included to ones of a more technological nature, excluding, for example, business model innovation ideas, marketing innovation ideas, etc., and that care should be taken not to generalize the findings to different types of innovations and ideas beyond clearly technology-based ones. However, despite these limitations to the generalizability of our study, questions regarding the use of cross-departmental collaboration for ideation remains. Does this type of idea-generating activities represent an untapped potential or, alternatively, does this type of cross-functional work actually not create a suitable setting for new ideas to emerge but primarily offer the possibility of efficiently bringing together different viewpoints and knowledge sets at a later stage of the innovation process? One possible way of making sense of these somewhat surprising observations is that there may be a need for stronger integration mechanisms that can help colleagues from different departments to overcome initial issues related to cognitive distance.

When contrasting the two different knowledge creation processes, it was found that in-depth analysis primarily happened with colleagues in one's own group, whereas combination took place both in this narrow setting and with external parties. However, the observed knowledge creation processes did not seem to occur in cross-departmental interaction to a similar extent. With regard to the prevalent use of in-depth analysis when creating ideas with close colleagues, this is in line with existing theories emphasizing knowledge redundancy (van de Ven, 1986; Nonaka, 1994) and tacit knowledge components (Nonaka, 1994; Szulanski, 1996), as well as the literature on communities of practice, and their features in terms of, for example, shared language and common objectives (Wenger & Snyder, 2000).

In terms of combination, it is seen that there may in fact be some objective ground for the sweeping claims regarding improved innovation performance that are frequently found in the Open innovation literature (see, e.g., Chesbrough, 2003). However, what should be noted is that these positive effects seem to be restricted to knowledge creation in terms of combination, and this insight may help firms to evaluate the potential value in terms of new ideas that they could derive from Open innovation practices. If innovation in a specific firm or industry is clearly based primarily on analysis, it could be more viable to use internal search processes. However, it is here necessary to make a distinction between Open innovation mechanisms that imply communication between individuals with high levels of shared knowledge, such as engineers and scientists with similar specialized knowledge working in different firms, and Open innovation mechanisms that connect individuals with different knowledge sets. Hence, there is clearly a need for distinguishing between different types of Open innovation mechanisms, taking the main type of knowledge creation involved as a possible starting point.

Although somewhat surprising, the lack of observed inter-relationships between cross-departmental collaboration and ideation found in this study does not, of course, mean that interaction with people in other departments is not important for innovation. Besides the above-mentioned risk that this study addresses innovation in an overly technology-oriented and narrow way, it nevertheless highlights potential issues related to cross-functional work in ideation. Contrasting our results with those of Björk (2012), who found that individuals who had generated ideas with colleagues in other knowledge domains of the organization had higher ideation performance in terms of their ideas' perceived novelty and usefulness, we do not see such positive effects of cross-departmental networking. One reasonable explanation is the use of patents to measure ideation performance, as this excludes many types of innovations that are likely to emerge in cross-functional settings, both in terms of their content and in terms of how radical they are. As the demands for patenting in terms of novelty are quite high, many good ideas do not meet these demands but are nevertheless of great value for the company. Moreover, it should be emphasized that cross-functional work is undoubtedly important for exploiting ideas, and if ideas should not merely stay ideas but be converted into value in terms of innovations, the implementation and use of ideas need to be supported by individuals representing different parts of a company (Björk, Boccardelli & Magnusson, 2010). Another possible explanation for the non-significant 'Other Department' variable could be the organizational structure that was in place at the time of the survey. Separating similar functional units into separate categories could potentially make the knowledge redundancy within each category weaker at the same time as it limits the level of common language and understanding between different groups (product development, marketing, etc.) within the same category.

Altogether, the study shows that ideation, just like innovation, is a complex and composed activity, and that there are no simple solutions available. Consequently, the right way to organize ideation, including attempts to further and support more or less distant interactions, is at least to some extent a matter of knowing what results are desired. In order to facilitate and support fruitful collaboration and networking behaviours in ideation, management should thus take into account both what type of innovation is aimed for and which knowledge creation processes are most central for the corresponding ideation needs. However, just as some research indicates that the most innovative individuals manage to fruitfully combine a large number of distant and heterogeneous relationships with a smaller and more cohesive network (Kijkuit & van den Ende, 2007), similar paradoxical strivings (see, e.g., Magnusson & Martini, 2008) need to be taken into account in the design and management of firms' overall ideation systems.

The performed study presents findings about networking distance and its interrelationship with the way knowledge is created. More specifically, it is seen that networking on a more distant level often results in new knowledge through the combination of existing ideas and information, whereas interacting with one's closest surroundings more often results in new knowledge through in-depth analysis. The research design used only allows for correlation analysis, but not for empirically testing causal relationships. The causal nature of the observed relationships can thus only be based on logical reasoning and insights from existing theory. Moreover, the study does not take time and dynamics into account, something that arguably needs to be addressed in future studies. McFadyen and Cannella (2004) investigated the changing effects of strong relationships on knowledge creation over time, pointing out that initial positive effects of strong relationships can turn into negative effects as the drawbacks connected to group norms and expectations and obligations limiting creativity increasingly come to exceed the positive gains from shared experiences and related friendship, trust and shared language. Consequently, time also plays a significant role and should thus be included in more comprehensive, multidimensional frameworks addressing organizational distance and knowledge creation.

A further limitation to this study is that it is based on data from one company only. In order to allow for more extensive generalization, additional empirical studies are needed. As a final limitation, patents are used as the dependent variable, and in the company in question patents are considered to be a very important output of the ideation process, given their high importance in the specific industry. However, as other types of innovative ideas that are not patentable also exist within the firm, the use of another ideation performance measure that also includes these non-patentable ideas would constitute a clear improvement to the study.

This study has found organizational distance to affect the type of knowledge creation taking place in ideation, but more studies of this important activity within firms are needed to generate more generalizable results. It would also be of interest to further explore how managers in firms can guide and support fruitful networking behaviours among their employees to fully elaborate on this study's findings.

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