

CHALLENGES IN NETWORKED INNOVATION

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ABSTRACT

The paper presents an exploratory study within a longitudinal research project on open innovation and, specifically, the collaboration of two or more companies, called *networked innovation*. Nine companies were interviewed to gain information on their motivation to use networked innovation and the challenges they encounter in doing so. They used two network types: *elite circle* and *consortium*. Challenges showed at different levels, concerning organization, project and actors. At organizational level, dominant factors determined whether a network could be started at all, mainly concerning companies within highly regulated sectors. At project level, the difficulties of networked innovation appeared in the form of highly dynamic processes to which traditional methods no longer apply. At actor level problems already known from intra-organizational teamwork showed up, augmented by the confrontation with different company cultures. The results are currently used as a basis for further research by a multidisciplinary team investigating networked innovation at the three levels mentioned.

Keywords: Open innovation / networked innovation / network types / motivation / collaboration barriers

1 INTRODUCTION

Currently, more and more companies are attracted to trade traditional in-company product innovation against new forms of collaboration. Former customers and suppliers, for instance, become partners who share risks and gains, or end-users are invited to contribute ideas to product development. Those are just two examples within a variety of new collaboration forms which are labeled *open innovation* [1]. Sharing financial risks or getting user information at an early development stage can be important stimuli to change one's innovation routine. Once practising open innovation, however, companies face problems which are completely new to them, which are complex and which arise at different organizational levels. Because of their newness and complexity, few solutions exist yet. This gave the incentive to study the way companies currently deal with open innovation, in a longitudinal study and from a multidisciplinary perspective, combining different organizational levels and aiming to develop tools and methods to facilitate open innovation. The research project concentrates, however, on just one variety of open innovation: the collaboration of two or more companies in a partnership, which will be referred to as 'networked innovation' in the following text. Other forms of open innovation (such as crowd sourcing) are beyond the scope of the project. The paper at hand describes the first study of the longitudinal research project.

Research literature describes the pros en cons of open innovation. Combining expertise, for example, reduces costs, provides information that would otherwise be closed to a company, or allows companies to do projects together that would be out of scope for a single company [2], [3], [4]. On the other hand, several problems are likely to occur at different levels and throughout the innovation process. At an organizational level, challenges are, for instance, how to find a good partner [5] or how to deal with intellectual property rights [6], [7]. During projects, the absence of an alignment of goals can hinder the success of an innovation [8], [9]. Teams may, among others, encounter cultural differences [10] or find it difficult to transfer the appropriate amount of knowledge to the right team members [3], [10], [11], [12].

Although research has identified possible challenges in open innovation, it is still unknown if these apply to all companies, if some are more important than others, or if a combination of challenges (perhaps occurring at different organizational levels) will lead to even more complex and problematic situations. Therefore, an exploratory study was carried out to gain first insights in the way companies handle open innovation in their own way and in the challenges they meet. This paper focuses on two of the research questions that were dealt with in the study: 'Why do companies opt for networked innovation?' and 'Which challenges do companies meet in networked innovation?'

2 RESEARCH DESIGN

From several companies who were motivated to improve their current approach to open innovation, nine were selected to be main partners during a four-year long research project. All of them are European companies and they were chosen because of their diversity in company size, product range and business sector.

They range from large-sized companies to small and medium enterprises and are operating in electronics, food, aircraft, transportation and industrial design. Business-to-business and business-to-consumer products were represented among these. Companies who professionally support innovation were represented by an innovation consultancy, a regional network of high-tech companies and a foundation aimed at stimulating innovation in The Netherlands. All companies already had experience in open innovation and had expressed interest in networked innovation.

Each company had delegated a contact person from senior management who was interviewed two times in a semi-structured setup. The results were verified by the interviewed managers.

3 RESULTS

The results are presented according to the following main questions: ‘Why do companies opt for networked innovation?’ and ‘Which challenges do companies meet in networked innovation?’

The interviewed persons named a variety of problems which can be related to three levels: firstly, inter- and intra-organizational issues; secondly, issues at project level; and thirdly, issues relating to the different actors in a networked project (based on the work of Kleinsmann, Buijs and Valkenburg [13]). They will be addressed in this order.

3.1 The companies’ motivation to networked innovation

All companies stated that the traditional closed innovation approach had become too limited to stay competitive. Two main reasons why they started networked innovation were: a) a need to improve the innovation process and b) a need to improve the products or product range. Both motives could occur within the same company. Table 1 gives an overview of the companies’ motivation and the sort of partners they are collaborating with.

The main motivation for *improving the innovation process* is acceleration (stated by companies 1, 2, 4, 5) and the saving of time and money by sharing efforts (mainly company 1, but also mentioned by the other producing companies). By company 1, who had the most experience in networked innovation, proving the effect of an innovation route was also mentioned.

Partnerships are mainly set up with knowledge institutes and partner companies with complementary competences. Subsidized innovation programs make companies enter into temporary collaborations with their competitors (company 3 and 4).

The main motivation for *improving the companies’ products or product range* (stated by companies 2, 3, 4, 5, 6) is risk sharing. For instance by choosing a partner to innovate with, instead of paying for rendered services. The products of companies 3 and 4 went through a decrease of profits over time. Both companies therefore wanted to expand their product range with services grouped around their core business and needed a partner with complementary expertise in doing so.

Improving the process of open innovation is a principal motivator for the consultancies (7,8,9), who initiate and facilitate open innovation processes. All consultancies state that setting up networked innovation projects is difficult: companies tend to linger at the first step of idea generation and do not easily take the necessary next step to problem ownership.

At the time of interviewing, none of the companies was confident about their current approach to networked innovation and they are all actively improving it. These improvements range from a struggle to get networked innovation started at all to trying out new methods to optimize processes. All companies regret the lack of proven methods or described best cases to use in networked innovation.

Table 1: Business sector, motivation and choice of partners of the companies in networked innovation

Company	Business sector	Motivation	Partners
(1)	Electronics	Accelerating innovation process, proving effect of innovation at an early stage to save time and money	Knowledge institutes; companies delivering enabling technologies and/or missing complementary competences
(2)	Food	Accelerating innovation process, expanding product range	Knowledge institutes; companies delivering enabling technologies
(3)	Aircraft components	Expanding product range to non-tangible products and services around one's core business	Knowledge institutes; companies with complementary competences; competitors
(4)	Transportation	Accelerating innovation process; expanding product range to non-tangible products and services around one's core business	Companies with complementary competences; competitors
(5)	Aircraft interior	a) Being compelled to become a partner by former customer to share risks and gain knowledge; b) Collaborating with specialist companies (former suppliers) to share risks and gain knowledge; optimizing innovation processes	Customers; suppliers with enabling technologies and/or missing complementary competences
(6)	Industrial design	Gaining knowledge that is not present in company (marketing, sales, distribution)	Companies with complementary competences
(7)	Regional network	Supporting regional network of entrepreneurs to bring innovations to market	SMEs
(8)	Government-based foundation	Starting open innovation from social based themes to enhance innovation in The Netherlands	Companies of all sizes; knowledge institutes
(9)	Innovation consultancy	Supporting existing clients (large enterprises) in open innovation as an independent intermediary	Large companies

3.2 Challenges in networked innovation at an organizational level

At an organizational level, there are clear differences in what is experienced as a challenge by a company.

High degree of regulation within industries

At an organizational level, a main factor of influence to get networked innovation started is the type of industry. Companies 3, 4 and 5 operate in the aircraft and transportation industry. In these sectors, which are highly regulated, the number of possible partners is small, making the choice of finding an appropriate partner rather limited. Potential partners from outside the sector require a thorough approval process, costing time and money.

Differences in legislation and routines

Company 4, operating within the transport industry, is a full subsidiary of a non-European company. Subsidiary and owner operate within different legislations, which leads to different innovation approaches. Regulations, but also subsidies, stimulate or at least allow radical innovation for the European subsidiary, whereas the owner company operates in a setting that is rather oriented towards incremental innovation. Company 4 still has difficulties in getting innovation leaps that demand taking risks accepted by its owner.

Financing the networked innovation project

Companies find it difficult to invest time and money in a networked innovation project. Consultancies 7 and 8 explained this with two reasons: the outcome of networked innovation projects is often uncertain and has to be shared with partners, which makes companies reluctant to invest beforehand. Secondly, innovation in itself demands a different mindset: being able to think about future developments instead of day-to-day problems. Only few companies are able and willing to invest on long term development.

Subsidies are a means to support the initiation of networked innovation. All companies have experience with supported networked innovation projects, for instance through alumni grants for starting innovators, or government grants for established companies. Subsidies, however, also have drawbacks: their running length is either too short to build up a successful business (as company 7 experienced when supporting young innovators), or the terms of subsidy force competitors to work together. All industry companies provided examples of subsidized projects with competitors which resulted in unsuccessful collaborations caused by the irrelevance of the topics, unbalanced benefits for the partners or a general lack of trust between partners.

Different size of companies

All interviewed persons agreed that the different size of collaborating companies is a main challenge during projects, especially after business case definition. There is no balance in power: larger companies tend to be more dominant. Time frames also differ between differently sized companies. Company 1 (a large sized company) indicated that this can cause processes to get out of tune and bring small companies into difficulties to finance the project. Related to this, the dynamics of the decision-making process also tend to differ radically. One of the companies even indicated that, after several bad experiences, they decided to stop collaborating with big firms in an open innovation setting.

Trust

As indicated by all companies, the foremost mentioned barriers against establishing networked innovation deal with trust. Especially the companies in highly regulated industries with relatively few players (company 3,4,5), encounter trust issues. Possible partners are either well-established customers and suppliers, or they are newcomers to the market. In the first case, the customer-supplier relationship is likely to remain next to a networked relationship, making the same companies constantly having to switch roles. This affects the handling of information: an equal partner should be amply provided, whereas the information towards a supplier remains on a strict need-to-know basis. In the second case, newcomers have to pass through a thorough application procedure before they are admitted to the sector, having to invest time and money before they are even allowed to collaborate. Companies 3 and 5 indicated that throughout the aircraft sector, company partnerships have in the past led to unwanted takeovers, which had urged companies to screen off information even more.

This factor gets more important the closer a development gets to a business case. The interviewed transportation/aircraft companies do not expect changes in this approach in the foreseeable future. Nevertheless, companies 3 and 5 chose to set up a parallel, more independent innovation route which was not compromised by trust questions: together with partners they decided to build strategies about future developments, using scenarios. These activities are either financed by subsidies (which have to be used in the pre-competitive stage) or by their own resources.

Finding partners

The challenge of having few potential partners has already been stated in relation to trust issues. Yet, companies also experienced other problems which were brought about by the size of their own, relatively small business networks: they see them as one of the main causes why they have not been able to start successful collaborative innovation. The reasons why a network stays (too) small differ. It may be due to: (i) the aforementioned small size of the business sector (companies 3,4,5); (ii) a lack of experience in building networks that prevails throughout the own organization, which is aggravated by cutbacks in times of economical crisis (company 4); (iii) or a general lack of interest and commitment of entrepreneurs to invest in open innovation (stated by consultancies 8 and 9).

3.3 Challenges in networked innovation at project level

At this level, the newness of networked innovation becomes most evident. All participating companies still had to find their way through dynamic processes where the use of established methods falls short.

Lack of established methods

At project level, the main barrier to realize a networked innovation project relates to a general lack of methods concerning networked innovation processes. Especially the companies who had more experience with networked innovation and the consultancies indicated the lack of reliable methods.

Company 1, which had ample experience in networked innovation, stated that the processes become much more dynamic and cease to be linear. Process steps tend to repeat themselves in a cyclic way and although they can be taken in a logic sequence, there is no guarantee that following them leads to results. Consequently, the original stakes are often not the ones that are finally leading to a successful business. For small enterprises, who mostly do not have the capital to compensate for the loss of investments if a project has to be terminated before bringing it to market, these dynamic open routes tend to be even riskier.

According to company 3, the double uncertainty of developing a new product or product system together with an unknown way of working makes networked innovation especially challenging.

The consultancies (company 7, 8, 9) confirmed that changing circumstances –for example that there is no paying customer in a networked innovation project- made their clients insecure about how they had to execute the innovation process. Consultancy 8 found it striking that even experienced innovators did not recognize their role in the process anymore.

The consultancies 8 and 9, which were experimenting with different approaches, wanted to get the supporting process more formalized. They stressed that there is still little knowledge about factors such as project management, business models, financial and legal aspects in relation to networked innovation.

Formalization of agreements

Trying to use a methodical approach to networked innovation does not automatically imply that formalized agreements have to be made, certainly not at an early innovation stage. Concerning the moment when a legal agreement should be made, the nine companies show different opinions. Company 1 learned from experience during the collaboration with a big partner company: from start the process was demarcated by contracts and became so stifled by legal caution that the, otherwise promising, project had to be discontinued prematurely. From then on, company 1 chose to carry out networked innovation projects without making any agreements at all at an early innovation stage. Contrarily, company 2 found that the complexity of networked innovation projects is easier to oversee if legal agreements are made at an early stage. A possible explanation for the varying views on agreements may be the different place in the innovation chain: the innovations of company 2 were relatively close to a marketable product, whereas the examples from company 1 came from the fuzzy front end of innovation. Closer to market introduction, company 1 also makes legal agreements.

Partnership management

Another challenge for the companies in networked innovation is to manage the partnership. On this item, the interviewed companies contributed different experiences: about the size of an innovation community, the experience of partners, balancing interests and, once again, trust. According to company 2, who had found that a project would otherwise lead to focusing on irrelevant themes, hindrance between partners and unbalanced gains, networked innovation projects should have a relatively small number of partners. Company 3 stressed that a collaboration with new or immature partners who lack contextual understanding can be very inefficient, as it needs overspecifying, thus causing more time and effort. Consultancy 9, who operates at the front end of innovation, met problems shortly after starting up a project: in the first innovation step of a project, ideas belonged to everybody. In the next stage, interests shifted: one company wanted to elaborate the idea in a certain way and was willing to invest more than the other parties. The relationship became imbalanced and it was difficult to allocate intellectual property. In that particular case, all parties were approximately even sized, large companies.

In a project of company 6, withholding information had been used as a tool to keep the partnership balanced: in a collaboration with an originally equal partner, company 6 gradually became more

dominant. The partner company reacted by withholding information, as it was their only means to keep the partnership more balanced.

Company 4 experienced the 'arranged partnerships' of subsidized projects as a drawback. In the relatively small transportation sector competitors are often forced to collaborate. Consequently, information is exchanged on a strict need to know-basis. In practice, this means that only final results are shared in subsidized networked innovation projects, but not the way in which they were obtained, which would be essential to transfer knowledge.

All companies agreed that the management of expectations needs more attention. Often expectations are not made explicit, be it at organizational, project or actor level. At project level, the outcome of a collaboration, especially at the early innovation stage, can not be predicted. Consequently, partners will leave the network once developments are perceived as uninteresting, company 1 stated. On the other hand, company 2 remarked it should be negotiable that a partner has to withdraw from a project if his role is not needed anymore due to content shifts in the project. The partner may not even realize in time that his contribution is no longer needed.

3.4 Challenges in networked innovation at actor level

At actor level the challenges indicated by the interviewed companies showed a remarkable similarity. The following themes emerged: the sharing of knowledge, relationships within teams, expectation management of team members and process related challenges.

The sharing of knowledge

Company 1 noted that there is a limit to the amount of information to be shared in a networked project. Team members of company 1, who had no confidence in members of the partner company being able to share the relevant knowledge, gathered as much information from them as was possible, which resulted in information overload and an overburdened and stressed team. According to company 6, too little consideration is given to determine which information is relevant to share during a project. In their opinion this would be an important step to improve networked innovation.

Companies 1 and 9 advised to aim for monodisciplinary teams in networked innovation, especially in collaborations of large companies, in order to facilitate knowledge transfer by a shared knowledge base.

Relationships within teams

Company 6 and 8 noted that strained relationships within an inter-organizational team tend to evoke passivity among the actors, which may result in project delays.

Teams react very sensitively to changes in their composition. Even if one member leaves the team because his contribution to the project is no longer relevant, this change can threaten the continuation of the whole project, companies 4 and 8 reported.

Expectation management of team members

In the experience of company 6, the expectations of individual team members rarely get the necessary attention. Companies assume too easily that the intents of team members match their assigned roles in the team and consequently, the companies tend to oversee goals and obligations that lie beyond the project at a professional or even personal level. As an example, in the case of company 6, other obligations of a partner had not been made explicit. Consequently, the partners developed different expectations about their performance, which only became apparent during an argument that threatened to destroy the relationship. Company 9, which organizes innovation sessions for big companies, contributed a different example regarding expectations. Representatives of the invited companies were only willing to attend if the other participating companies would send a person of equal or preferably higher rank than their own. It turned out that the motivation of the company representatives was not so much working on the primary goal of developing networked innovations, but rather to expand their own network. The effectiveness of the innovation sessions was rather negatively influenced by this unexpected behavior.

Process related challenges at actor level

Companies with ample experience in networked innovation remarked upon its higher complexity: processes become more dynamic and are not linear anymore - instead they are iterating in an

unpredictable way. Consequently, employees at all levels have to change established roles and expectations.

The employees of company 1, who were formerly accustomed to develop in a closed environment till the product was completed, had difficulties to adjust to networked collaboration at high speed and at an early development stage. It demanded an attitude shift from working in a safe environment towards seeking confrontation at all times and with all parties concerned, which the employees found rather threatening.

Company 8 saw that even for professionals with a long experience in innovation processes, collaboration in networked innovation teams alienated the process. As the client role as a structuring element is missing in networked processes, team members were unsuccessful in defining their roles in the process. Processes being hard to recognize as well as yet undefined end results often cause a passive attitude in team members in networked innovation.

4 DISCUSSION AND CONCLUSIONS

4.1 Motivation for networked innovation

This exploratory study gave an impression why companies are conducting networked innovation and which challenges they face in doing so.

As to the why, two goals showed repeatedly: *acceleration and optimization of the innovation process* and *expansion of a company's product range*. The latter was a main incentive for companies who had little experience in networked innovation, whereas the process improvements were more important to the companies who had conducted networked projects on a regular basis. In further research, it would be interesting to explore (i) if the difference between product-oriented and process-oriented goals can indeed be considered as indicator of maturity in conducting networked innovation and (ii) how the approaches differ between projects with product and process-oriented goals.

4.2 Network types

Based on the definitions given by Pisano and Verganti [14], table 2 shows for each company the network types mainly used. To the network types we added whether projects were mainly financed by the companies themselves or were supported by subsidies. The reason to include this characteristic was that results indicated that the added financial support changed some of the dynamics of networked innovation.

The companies engaged in only two of four network types: the *elite circle* (one company selects participants, defines the problem and chooses solutions) and the *consortium* (all participants take the decisions together). A third type, the *innovation community* (anybody can propose problems, offer solutions, and decide which solutions to use), appeared at the start of the networked innovation events of company 7 and 8, as their innovation kick-offs were open to interested companies who themselves could contribute innovation themes. However, once teams were built, usually directly after the kickoff meeting, the teams went on as *consortia*. Neither innovation communities true to their original definition nor innovation malls were reported. The study did not enquire about the motivations behind choosing a particular network type.

Table 2: Network forms used by the nine companies (according to Pisano and Verganti's definitions)

Company	Network type
1	Consortium
2	Elite circle
3	Consortium (subsidized)
4	Consortium (subsidized)
5	Elite circle
6	Elite circle
7	(Innovation community intended to lead to) consortium
8	(Innovation community intended to lead to) consortium (subsidized)
9	Consortium

4.3 Challenges at organizational, project and actor level

The study began with questions regarding the organizational level at which challenges of networked innovation occurred, and the effects they had.

At organizational level, the dominant factors were the ones that determined whether a networked project could be started at all: finding suitable partners and building a network; getting networked innovation accepted within one's own firm; financing; and of course, solving issues of trust. The companies who had the greatest difficulties to get networked projects started, belonged to sectors with the following characteristics: (i) business-to-business, (ii) relatively small, (iii) highly regulated, (iv) few established potential partners/competitors within the same sector and (v) thorough rules of admission for new partners. Although these circumstances are unlikely to change within the foreseeable future, these companies are nevertheless committed to conduct networked innovation and develop alternative approaches.

At project level, the lack of experience with networked innovation was the most obvious. All interviewed companies agreed that the innovation process differs so much from traditional innovation that familiar methods are no longer usable. All companies were, more or less successfully, trying out ways to handle and optimize networked innovation. The lack of methods showed to have influence at both organizational level (for example resulting in the lack of business models for the pre-competitive innovation phase) and team level (such as the organization of cross-company teams). All interviewed persons agreed that what they needed mostly are frameworks for the different stages of innovation, helping to realize fair, dynamic and not-frustrating relationships.

At actor level, problems already known from intra-organizational teamwork showed up, for example related to sharing knowledge or to managing expectations. Those were augmented by the confrontation with different company cultures.

5 FUTURE RESEARCH

The described exploratory study was the start of a multidisciplinary, longitudinal research project. Its primary goal was to obtain an overview of how networked innovation is carried out in practice, which differences exist compared to other types of innovation and, above all, to get a better picture of the challenges different types of companies face when carrying out networked innovation.

Different teams within the same project are now conducting in-depth studies at organizational, project and actor levels together with the partner companies.

In one of them, the authors of this paper are currently focusing on what emerged as a complex challenge from the exploratory study, namely, how to start innovation networks in highly regulated industries.

A following step will be to broaden the range of companies involved.

It will also be interesting to investigate the role of subsidies and the fact that subsidizers commonly demand to collaborate with competitors or with differently sized companies, such as SMEs. Both of these particular partnership types have been reported to cause tensions in projects.

We aim to gain deeper insights into the ways networked innovation should be carried out and, as a final goal of the total project, we aim to develop tools and methods which make networked innovation more reliable and accessible to a broader range of interested companies.

ACKNOWLEDGEMENTS

The authors wish to thank Maaïke Kleinsmann and Katinka Bergema sincerely for their support and for their inspiring contributions during the realization of this study.

The authors also gratefully acknowledge the support of the Innovation-Oriented Research Programme 'Integral Product Creation and Realization (IOP IPCR)' of the Netherlands Ministry of Economic Affairs.

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