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# Open Innovation Contests for Improving Healthcare – An Explorative Case Study Focusing on Challenges in a Testbed Initiative

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**Abstract.** Working with innovation is important in several sectors and industries. One emerging arena for innovation is the arrangements of innovation contests. The aim of the paper is to describe and characterize an open innovation contest for improving healthcare, and to address the challenges involved. The research is a qualitative, explorative and interpretive case study of a Swedish region providing publicly funded healthcare. The conclusions show the need to generate and analyze data from actors with several perspectives in the contest. Challenges identified include defining and precisely expressing the problem, separating and delimiting the different problems and achieving a joint view. Other challenges were identifying and attracting knowledgeable participants, to consider incentives, and communicating the contest. In the collaboration stage, challenges involved the contest design, enabling knowledge sharing, managing various agendas, and being open-minded to new ideas; and finally, assessing whether the problem is suitable for open innovation contests at all.

**Keywords:** Open innovation, innovation, innovation contests, open innovation process, healthcare, testbed

## 1 Introduction

Public healthcare, and government agencies in general, seems to be subject to transformation – processes and technologies need to be updated and improved (e.g. [1]) in order to deliver quality services to a growing, more informed, demanding, and ageing population. In the Swedish setting, similar to several other countries, different actors are trying to contribute to this transformation, including the Swedish innovation agency Vinnova. In 2012 Vinnova launched a call for supporting county councils and regions providing publicly funded healthcare to set up organizations that can facilitate innovative IT-solutions and other preconditions for innovation. The purpose with that initiative was to support building and establishing structures for enabling innovations

in healthcare; called ‘testbeds’. These testbeds are meant to work as platforms for external businesses, as well as employees in healthcare, to test and implement various types of innovations in the healthcare system. As part of their testbed activities, several institutions have launched innovation contests. We regard such contests as examples of open innovation (OI). Piller and West [2] elaborate on OI and divide its process into four stages; defining, finding participants, collaborating, and leveraging. These stages are used to structure the analysis below.

In the Swedish context, the use of innovation contests for this purpose is still a novel phenomenon and many institutions are trying this out for the first time. Consequently, there are few empirical studies of these initiatives, and those that exist illustrate how problems experienced in healthcare are typically complex and seem to require in-depth knowledge. Perhaps these problems are too complex to be addressed through OI contests? For example, Hellberg’s [3] study of an innovation contest involving the use of open data, organized by a Swedish county council, illustrates that “[t]o have the ability to take part [in the contest] there is first a need for knowledge on the subject. Not many have this, because in general people do not know what public data is. Secondly, there is a need for competence to understand and use the data” (p. 272).

This paper illustrates and discusses an OI contest organized by a Swedish region providing publicly funded healthcare. The aim of this paper is to: 1) describe and characterize an OI contest for improving healthcare, and 2) to address the challenges identified in this case. The identified challenges can be understood as aspects to address from a practical point of view when improving healthcare, and as an inspiration for further research.

The paper is organized as follows; first, the theoretical background of the paper is presented; second, the research approach is discussed; third, the case study is described; fourth, the analysis and discussion; and finally, the conclusions are presented.

## 2 Theoretical Background

Innovation is a buzzword echoing throughout public and private sector as well as academia. Although often vaguely defined, the etymological meaning of innovation refers to the introduction of novelties, alteration of established forms through the introduction of new forms or a change in something [4]. Traditionally, the innovation process has been firm-centric where producers innovate to compete on a market. Today, this process is often opened up by purposely letting knowledge flow in and out of a firm, called Open Innovation (OI) [5]. Chesbrough distinguishes between inbound and outbound OI. The former refers to internal use of external knowledge, whereas the latter refers to external use of internal knowledge. These can also be divided into pecuniary and non-pecuniary OI [6]. *Revealing* refers to non-pecuniary outbound OI, e.g. when an organization discloses internal resources to the environment. Its pecuniary equivalent is *selling* information or ideas. *Sourcing* refers to non-pecuniary inbound OI, e.g. when organizations scan the environment for external sources of innovation such as ideas and technologies that may be incorporated into the

organization. Its pecuniary equivalent is *acquiring* these sources of innovation [6]. OI can be construed as an umbrella term [7] that includes many already existing innovation activities such as innovation contests. Hence, in this paper we consider innovation contests as an example of OI. The next section focuses on how an OI process can be construed.

## 2.1 Four Stages in the OI Process

Gassman and Enkel (in [2]) propose a mode of OI called *coupled process* where the inflow and outflow of knowledge and ideas are combined by “working in alliances with complementary partners” (p. 37). Piller and West elaborate on this concept and divide the process of coupled OI into four stages; 1) defining; 2) finding participants; 3) collaborating; and 4) leveraging.

The first stage of the OI process involves defining the problem to be addressed in the OI project. The problem, scope and performance criteria need to be expressed precisely, using vocabulary that is comprehensible for potential participants from different knowledge fields [2]. Nickerson and Zenger [8] draw on the ideas of Herbert Simon [9] and argue that problems can be *decomposable*, *nearly decomposable* or *nondecomposable*. Decomposable problems “can be subdivided into subproblems, each of which draws from rather specialized knowledge sets” [8] (p. 620). These subproblems are independent of one another, which mean that interaction is not needed between solvers of the various subproblems and hence are suited for outsourcing to a crowd or a market [8]. Nondecomposable problems, on the other hand, are ill-structured and not possible to divide into subproblems because of their “unexpected and unknown interactions among the potential different knowledge sets that make up the overall problems and the lack of definitive criteria for assessment of solutions” [10] (p. 1018). Instead, these problems call for a high level of interaction between people with various knowledge sets and, hence, knowledge transfer is of great importance. These complex problems are suited for problem-solving methods where people with different knowledge may interact and share their knowledge [8]. Nearly decomposable problems lie in between the two prior concepts. These problems may be divided into subproblems but interdependencies between the subproblems exist. This calls for a moderate level of interaction between knowledge sets [8]. Jeppesen and Lakhani [10] argue that most problems in real life fall into this last category. These are ill-structured problems that have been transformed and formalized so that they can be decomposed.

The second stage in the OI process involves finding suitable participants with relevant knowledge and skills. According to Piller and West [2], defining the problem is essential to attract participants and to identify relevant characteristics of possible contributors. However, Jeppesen and Lakhani [10] point out that problems are sometimes solved by nonobvious individuals with knowledge sets that at first sight do not seem to match the problem. They argue that new perspectives on a problem may lead to new and innovative solutions and hence, nonobvious and marginalized participants should be invited to partake in the OI project. When recruiting contributors, it is important to understand and strengthen participants’ incentives to collaborate and share

their knowledge. In the literature, incentives are often divided into monetary (e.g. prizes, selling or licensing information) and non-monetary (e.g. possibility to fulfill their own needs, career-visibility or social motives). In reality, this distinction is usually blurred and various participants are motivated both by monetary and non-monetary incentives [2]. The recruitment process is generally driven by the initiator of the OI project. Piller and West [2] distinguish between three recruitment strategies; *open call*, *selective open call* and *open search*. The first strategy is directed towards a broad and undefined group of participants (cf. crowdsourcing), whereas the second strategy pin-points suitable groups of participants (e.g. experts, market segments) and directs the call towards these. In the third strategy, the initiator actively engages in identifying suitable participants and invites them to collaborate.

The third stage in the OI process involves the interactive collaboration between the initiator and external participants. Piller and West [2] argue that this is “[t]he key value creation process” (p. 40) in which new innovations are created. The initiator has to create and implement structures for collaboration to monitor and manage the value creation and also define the span of control and influence given to external participants. Participants who are given a high level of freedom become engaged but this gives the initiator less power to control the processes. Also, internal attitudes and competences should be addressed to facilitate collaboration, e.g. the willingness to open up for sharing and exchanging information and knowledge. These ideas are also echoed in the literature on innovation contests. This kind of events can be designed to support competition or collaboration to varying degrees. Lampel et al. [11] argue that contests with only one award nurtures a winner-takes-it-all mindset whereas a more collaborative approach usually has several prizes to recognize different participants’ contributions and cultivate a culture of knowledge sharing, networking and learning from each other through interaction. Furthermore, innovation contests may range from having broad to narrow goals and organizers and participants join the contest with different agendas. These agendas affect the goal and process of the contest [11].

The final stage concerns the leveraging and exploitation of the collaboration results, e.g. through integrating the new knowledge into the organization and commercializing the innovation. This stage is not within the scope of this paper.

### **3 Research Approach**

The empirical data in this paper was collected as part of a research project designed to study and document the formation and evolution of a testbed initiative in a region in Sweden. The testbed initiative is based at a regional university hospital, is funded by Vinnova, and was approved with the exclusive criteria that researchers had to be part of the development, set-up and the evaluation of the testbed. Hence, our research project is financed as a part of the particular testbed initiative in focus. The research project is managed by the university and runs through 2013-2015. The overall research questions addressed in the project include exploring: 1) What constitutes a testbed in this particular organization? 2) How is the testbed organized and coordinated? and 3) What stakeholders are involved and managed by the project management? The project group responsible for the testbed organized an innovation contest in 2014.

As a part of the project we were allowed to study the contest, generating empirical data through semi-structured face-to-face interviews and participatory observation during the process. We conducted seven interviews with an average duration of approximately 40-45 minutes. The interviews included conversations with the project manager, two clinic representatives and one development director on the regional level. We also attended ten meetings with the average duration of 90 minutes per meeting. The meetings contained actors from the project team, a competing team in the innovation contest, and one external researcher from The Swedish National Road and Transport Research Institute (VTI). The meetings were distributed in time and along the planning and executing process of the innovation contest. They covered the introduction, different stages of the contest, coordination, and the finale. On one occasion, a meeting was videotaped and analyzed by the researchers at a later stage. The interviews took place between April and October 2014; the meetings took place the same year between February and October.

One researcher from the research project was present at the meetings, and one or two researchers conducted the interviews. The qualitative data have been analyzed using a hermeneutic approach [12]. The research presented in this paper is hence conducted as a qualitative case study and is built on interpretive assumptions of the world [13]. For the theoretical foundation, hermeneutic literature reviews were conducted [14]; focusing on key terms such as innovation, open innovation, innovation contests. The overall testbed initiative can be classified as action research, whereas the research activities focused in this paper can be understood as a qualitative and interpretive case study.

## **4 The Case – The Innovation Contest**

This section describes the contest and its context, and gives an account of what happened before, during, and after the contest. In addition, it presents a number of challenges encountered during the innovation contest.

### **4.1 Before the Contest**

The innovation contest was led by a project team consisting of a project manager from the region's testbed organization, two other members from the same setting and a chief physician and two occupational therapists from a medical clinic. The problem that was to be solved in the contest was introduced by employees at one of the region's medical clinics, who worked with assessments of patients with brain injury and their ability to drive a vehicle. According to the staff at the clinic, proper methods to assess people's ability to drive and the deterioration of intellectual abilities that may occur after brain injury were missing. The methods available were a driving simulator and paper-based psychological tests, but these methods were not perceived as sensitive and reliable enough. The technology was seen as old and unpredictable as the computers often broke down. Hence, the staff at the clinic saw a need to develop a simple, yet secure, method to assess a person's driving ability after brain injury.

The project team came up with a contest design that was rather complex, containing multiple stages, (including ideation, lo-fi prototyping and executable prototyping) and two tracks – an open track and a conventional track. The open track was meant to focus on open innovation and ideation where the work of the participants was to be presented openly after each stage. The conventional track was meant for firms that wanted to compete but that did not wish to disclose their product development or other internal business secrets. At the last stage in the contest, the two tracks were meant to be merged and all entries were to compete against each other. The project team also specified evaluation requirements for assessing the solutions resulting from the contest. These were expressed in a list of 14 requirements, e.g., ecological validity, reliability, possibility to configure the solution after current needs. There were no criteria concerning what problem the solution should solve. The competing teams' solutions were to be assessed by the project team.

The innovation contest was meant to be open for everyone, e.g. individuals, students, associations, organizations and firms, and people were allowed to compete alone or in teams. In order to attract contestants, the project team organized three introductory meetings to inform people about the contest. Information about these meetings was communicated through their webpage, e-mail to companies and educational programs at the university, the region's twitter account, and to some extent in local media. Wanting to attract anyone who could be interested in the contest, the project team did not articulate any special target group for their communication. Nonetheless, during internal meetings, they discussed e.g. cognitive science, medicine, programming, technology and psychology as possible target groups. Concerning incentives for participating in the contest, the team reflected only slightly on what the contest could offer to the participants. They concluded that contestants could make a civic contribution and create a product, or business idea.

The day of the first introductory meeting, no one showed up. Interestingly, no participants showed up for the second or third introductory meetings either. The team concluded that reaching out to participants was a bigger challenge than what they had thought. Because of the lack of participants, the whole contest was rescheduled and redesigned from three stages and two tracks to only focus on two stages; ideation and lo-fi prototyping. The project team wanted to find a contestant that could be interested in spending a lot of time on the task at hand and in cooperating also after the contest. For these reasons, the idea to only work with the first two parts of the contest was seen as a good way to continue. Thereafter, a fourth introductory meeting was held and six individuals showed up to this meeting. These were all personally invited by the project manager and they represented various organizations, e.g. IT and management consultancy firms and departments in the region. None of these participants decided to join the contest.

## **4.2 During the Contest**

Only one team signed up for the contest by the registration deadline. This was an IT consultancy firm that had been contacted directly by the project team, encouraging them to join the contest. Thus, the contest contained only one competing team. Now

that the contest had a contestant, the first part of the contest (ideation) was launched. The competing team presented their work and explained that they had started their process by talking to the medical staff, gathering information and forming an understanding of the problem at hand. They also visited the Swedish National Road and Transport Research Institute (VTI), an organization that develops driving simulators and performs research on these issues. The team's solution was a scalable and modular technology platform that was meant to fill the needs in primary healthcare; a platform that can be used as a first screening device by simple tests on a tablet, but that can also be used at the specialist clinic using full scale simulators. Note however that the competing team pointed out that they did not have the competence to develop the medical tests to put into the platform. Instead, they asked for help to choose an existing test that they could turn into a tablet application.

After the ideation stage, the project team evaluated the proposed solution together with the director of research from VTI and concluded that the scalability was a good feature. They also concluded that the competing team had included more features in the solution than was outlined in the specification of requirements. These new features were seen as good, but raised the question of what should be put into the prototype. The project team thought that a solution of the problem was missing in the contestant's presentation and wanted a dynamic test in which cognitive and metacognitive abilities were taken into consideration. The researcher from VTI pointed out however, that metacognition is very difficult to measure.

The next step in the contest was the prototyping stage. The project team and the competing team discussed what content could be put into the platform as a first prototype. The project team emphasized that the competing team should focus on the screening instrument, and not the other features that was presented in the first stage. The competing team concluded that they needed help from VTI to choose what types of cognitive tests that could be developed for the platform.

By the end of the contest, the competing team presented their perception of the problem area once more, followed by a description of their solution. They pointed out that they did not know how to produce tests that could measure cognitive abilities, but that their approach instead was to create a whole technical concept around the problem. Their prototype built on a cognitive test suggested by VTI that had been translated from a paper form to a test on a tablet. After the presentation, the project team adjourned to discuss whether or not the competing team had met the requirements of the contest. The project group concluded that the solution was not novel, but just a matter of digitalization of a paper form. In addition, the test that was chosen had not been tested in relation to driving and was therefore not properly validated. The tablet solution did have some advantages however, in terms of enabling instant feedback and creating possibilities for digitizing additional tests into the tablet that could be useful when screening patients. Despite these flaws in the solution, the project team found that most of the 14 requirements had been fulfilled; resulting in a situation where the competing team's solution was deemed to fulfill the contest requirements despite the fact that the solution did not solve the problem at hand. The competing team was chosen as winners of the contest and all participants agreed that they wanted



to continue cooperating after the contest. After a prize ceremony, the contest was perceived as finished.

### **4.3 After the Contest**

All involved actors were overall content with their part in the contest, but had different views on the outcome of the contest. The testbed representative thought that they had learnt a lot from trying out a new work format; they had realized how much work it took to communicate such an event and that it was difficult to attract participants. In turn, the competing team was happy with their achievements in the contest. They had made an executable prototype, which was not even required by the contest rules. However, they thought that the project team was not open to a new approach and broader problem formulation. The competing team felt that the clinic would rather just have their old technological equipment replaced by new technology but with similar features. Last, the representative from the clinic was disappointed that the problem had not been solved, meaning that the challenges in their work at the clinic were still prevalent. One of the clinic staff argued that a replacement of the old technology would have solved their problem at the specialist clinic, but that this solution would not have been considered innovative. Even though the participants disagreed on the success of the outcome, all of the participants wanted to continue their cooperation to develop the solution further.

### **4.4 Challenges Encountered During the Contest**

Many challenges were encountered during the contest. In this section, we discuss some of these challenges in relation to three themes identified in the empirical data; 1) the contest's problem formulation; 2) the participants' expectations and goals; and 3) cooperation, communication and competence.

First, an obvious challenge illustrated in the description above concerns the problem to be solved by the contest. The problem that contestants were to solve in the contest was formulated differently throughout the information that was disseminated by the project team. For instance, the problem was phrased as follows: A way/method/appropriate tool to easily/reliably/cost-effectively assess/measure/identify a person's ability/condition/cognitive skill to safely drive in traffic after brain injury. Furthermore, the cognitive abilities that the clinic wished to assess, measure or identify were described differently in the written, versus oral, presentations of the problem. When reflecting on their problem formulation, the project team argued that few people could understand what the problem entailed. In the framing of the problem, the project team was also unclear concerning in what medical context the test was to be applied. The solution that the project team was searching for was to be applied in primary healthcare, and not in the specialist clinic. The competing team, however, thought that the solution was to be implemented at the specialist clinic.

The contest's problem formulation was also expressed differently by its various participants. For example, the project manager emphasized certain aspects of the problem, whereas the representatives from the clinic emphasized other aspects. A

possible reason to the uncertainties concerning the problem formulation, given by the project manager, was that the complexity of the problem was unveiled for the project management members as the contest progressed. As a result of the vague problem description, the competing team came up with their interpretation of the problem. Their interpretation of the problem was more general, and more focused on the technical platform of the test, rather than the test in itself. Based on their interpretation of the problem, the competing team changed the focus of the contest to create a modular framework. They argued that they did not know how to develop the tests per se, instead their solution was to create a whole concept in which tests can be incorporated in different platforms within the framework.

Concerning the second theme, the participants' expectations and goals with the contest varied. From the clinic's point of view, the goal was to find a solution to their problem. One person from the clinical staff expected that the contest would lead to a new product that could be used at the clinic. The testbed representatives, on the other hand, wanted to try out innovation contests as a work method, but also to create opportunities to cooperate with researchers, innovators, and firms in other ways than public procurement. The competing team expected to get access to the clinic and problem owners in order to discuss the problem and come up with a good solution. They also anticipated new business opportunities and relationship building with the region, since these were customers they wished to work with.

Concerning the last theme, both the representative from the clinic and the competing team thought that the level of cooperation between the two parties had been fairly low during the contest and that more cooperation would have been necessary for a better solution. The competing team felt that they did not get access to the knowledge and cooperation that they had expected. One reason for this was that the clinic did not want to reveal too much information since they thought that this would steer or bias the competing team and hence inhibit their innovative ability. The clinic representative said that they did not want to tell them to replace their old technology but that it was difficult to describe what they were looking for. Last, there were some additional communication problems. The competing team repeatedly said that they did not have the skills to develop medical tests, but the clinic did not become aware of this until late in the contest. The competing team argued that they could only develop the technological parts of a test if they were told what the test was to consist of. At the same time, the clinic repeatedly stressed that they needed help to develop the tests. When asked who had the competence to develop tests, the competing team referred to VTI, researchers and the chief physician at the clinic, whereas the clinic representative referred to occupational therapists and VTI, rather than to physicians. However, both parties thought that the cooperation and communication would become more clear and unambiguous now that the contest was over.

## **5 Analysis and Discussion**

The aim of this paper is to: 1) describe and characterize an open innovation contest for improving healthcare, and 2) to address the challenges identified in our case. The

former section described an open innovation contest; in this section we turn to the identified challenges in the light of theory.

### 5.1 Challenges Related to the Problem Definition Stage

Piller and West [2] emphasize the importance of defining the problem to be solved in OI processes. This was a major challenge in the innovation contest. For instance, the problem was expressed in many different ways in the written information and by the participants; there were no criteria for assessing the chosen solution, i.e. what problem the solution should solve; and there were confusion concerning whether the solution should be applied in the specialist clinic or in primary healthcare. Furthermore, many cognitive abilities were mentioned as important when assessing people's ability to drive. Metacognitive abilities were also pointed out as complex and difficult to measure. These examples imply that the problem formulation was ambiguous, ill-structured and complex. It is however hard to tell if the problem was nondecomposable or if it just had not been thoroughly formalized and divided into subproblems. The major challenges in the definition stage in this particular innovation contest were to define and precisely express the problem; to separate and delimit different actors' problems (i.e. the specialist clinic's problem versus primary healthcare's problem), to communicate the problem(s) and to achieve a (fairly) joint view of it.

### 5.2 Challenges Related to the Stage of Finding and Attracting Participants

To identify and attract suitable participants proved to be a major challenge in the innovation contest. The project team used the strategy *Open call* [2] by opening up their problem to a broad and undefined crowd. The team wanted the contest to be open to anyone, as they forecasted opportunities for innovation by putting people with heterogeneous competences together. However, there was little funding for communicating the contest as an event and the project team thought that it would be sufficient to inform about the contest through the organization's website and through e-mails. Hence, it was difficult to spread information about the contest in order to ensure participants. When realizing that the chosen communication strategy was not effective, they switched to an *Open search* [2] approach where they actively searched for and invited 'head hunted' participants. Furthermore, the project group seems to have overestimated the interest and the incentives for participating in the contest; they only managed to find *one* participating team. Our analysis shows that the issue of incentives was not discussed by the project group to any greater extent. However, previous research shows that it is essential to take possible participants' incentives into consideration [2]. This difficulty is also illustrated by Hellberg [3], who argues that it is hard to get the right people interested in participating in contests like these. Our research clearly supports these difficulties.

Another part of the challenge to find and attract participants had to do with identification of relevant knowledge sets and competence that could help to solve the problem. In the studied contest, the problem was not solved partly because important knowledge sets were missing. The clinic initiated the contest because they did not

have the appropriate skills, knowledge and competence to solve their problem internally. The competing team also articulated that the knowledge about how medical tests should be developed was missing in the contest. This indicates that crucial knowledge sets for solving the problem were not present in the contest. One explanation for this could be that the ambiguous, ill-structured and complex problem formulation, as mentioned above, made it difficult to assess what knowledge sets and competence that were needed to find a solution. This may not be apparent even with a well-defined problem, since solutions can come from people with unexpected competences [10] – but when it is evident that knowledge is missing, new sources of knowledge should be searched for. To conclude, the major challenges in this stage were to identify and attract participants with relevant knowledge sets, to consider participants' incentives, to choose and communicate an effective recruitment strategy.

### 5.3 Challenges Related to the Collaboration Stage

The problem to be solved in an OI process should fit the contest design [8] and the design and structure will also affect the collaboration between the initiator and external participants [2]. Without a clear picture of the problem it is difficult to make informed decisions about contest event design – whether the problem calls for interaction between people with different knowledge sets or if it is more suitable for crowdsourcing where interaction is less crucial. A challenge in this particular innovation contest was to fit the design of the contest to the problem at hand, or vice versa, to formulate a problem that suited the contest design. As mentioned above, it is hard to tell whether the contest's problem is decomposable and, thus, suited for the open contest design, or whether the problem is truly nondecomposable and that the design should have emphasized more collaboration [8]. Our analysis shows that there are indications that more collaboration was needed. For instance, all participants wanted to collaborate *after* the contest and several participants expressed that collaboration would be easier when the contest was over. Again, if the problem is nondecomposable, a design that enables interaction between knowledge sets and accelerates knowledge transfer is preferable [8].

Interaction can be managed by designing structures for collaboration which enables the OI initiator to steer these processes [2]. The vague problem formulation in the contest made it possible for the competing team to reinterpret, broaden and even redefine the problem from their perspective. Hence, the ambiguous problem definition opened up for a broad control span for the contestants [2]. In this sense, the structures for collaboration were loose and the possibility for the project team to monitor and manage this process was partly 'given away' [2]. However, that contestants interpret the contest's problem from their own perspective can probably not be, nor should be, avoided. On the contrary, Jeppesen and Lakhani [10] point out that disparate and marginal perspectives can open up for new solutions paths – the major reason of opening up the problem-solving process in the first place. This means that different interpretations do not have to be negative, but in this case the new perspective that the competing team suggested did not solve the problem; it was rather seen as out of scope by the project team. Thus, it seems like the initial ambiguity in the problem

formulation contributed to further ambiguity in the contest, in line with Piller and West's [2] idea of 'ambiguity in, ambiguity out' and that the problem formulation is one tool for the initiator to steer the collaboration process.

The collaboration process was also influenced by the participants' various agendas; the clinic wanted to solve their problems at the clinic and in primary healthcare, the testbed wanted to try out the innovation contest as a new way of working and to find and attract new partners to cooperate with. The competing team, on the other hand, wanted to get access to the clinic, establish new relationships and open up new business opportunities. The various goals of the participants also echoed in their views of the contest's outcome. Those with a narrower goal, to find a solution for the clinic, were more disappointed than those who had broader goals. This indicates challenges to manage various agendas and expectations in the contest and to create and implement structures for collaboration that meet these needs. Different forces will affect the contest design and if the 'wrong' goals are allowed to dominate the contest, this can lead the contest off track. In this particular contest, it seems that the goals to try out innovation contest as a work form and to create relationships were met, whereas the goal that initiated the contest was not fulfilled. Hence, the ambiguity echoing through the contest also affected the interaction and collaboration processes.

Another challenge in the studied open innovation contest was to be open. In the light of theory, the contest can be understood as a case of *outbound open innovation that is non-pecuniary*, i.e. *revealing* [6]. Initially, the project team aimed at revealing a problem, information and other internal resources such as the opportunity to talk to the staff at the clinic, to get access to clinical and technical competence, get support to advance and evaluate the winning entry. The revealing strategy is used when it is too difficult or expensive to develop something in-house [6]. However, the project team did not want to reveal too much of their thoughts and ideas since they did not want to limit the competing team's innovative ability. They did not want to 'bias' the competing team by telling them to replace the old technology. The competing team, who used a sourcing strategy, i.e. *non-pecuniary inbound open innovation* [6], wanted more collaboration and knowledge exchange with the clinic to be able to develop their solution. Hence, the 'openness' of the OI initiative was limited since they did not fully commit to their chosen strategy. This, in turn, limited the level of cooperation in the contest. A similar challenge was for the project team to be open-minded to new interpretations and to seriously consider new perspectives. For instance, the competing team did not feel that their new approach was taken into serious consideration. However, to facilitate collaboration, attitudes and willingness to open up need to be addressed [2].

A final challenge identified in our analysis of the empirical data was to assess whether the problem is suitable for open innovation contests at all, or if another project or event design would be better. There are some indications that the wish to be 'innovative' and to organize an innovation contest impeded the problem solving process in this particular case. As mentioned above, the level of revealing information and knowledge transfer was inhibited because the clinic did not want to 'bias' the competing team's innovative ability. Collaboration was inhibited for the same reasons although both parties thought that collaboration was needed to solve the problem. It

was also made clear that a replacement of the old technology would have solved the problem, but since this was not considered innovative enough, it was out of the question. Before designing and launching an innovation contest it could be useful to think about whether the innovation really is needed to solve the problem at hand, or if 'innovation' acts as an institutional pressure (e.g. [15]) to act as a modern and innovative organization in line with dominating norms. To uncover underlying assumptions of innovation processes can also be useful, i.e. whether innovative ideas occur in isolation (e.g. do not 'bias' the contestants), or if they occur through collaboration (e.g. design for interaction).

To conclude, challenges regarding the collaboration stage include fitting contest design and problem to one another, creating structures for collaboration to enable knowledge sharing and manage various agendas, being open by sharing knowledge and information and to be open-minded to new ideas, and finally, to assess whether the problem is suitable for open innovation contests at all.

## 6 Conclusions

The challenges identified in the analysis and discussion above can be summarized as follows based on the different stages in an open innovation contest; 1) In the definition stage, the major challenges were to define and precisely express the problem, to separate and delimit the different problems and achieve a (fairly) joint view of it. 2) In the stage of finding participants, the major challenges were to identify and attract participants with relevant knowledge sets, to consider participants' incentives, to choose a suitable recruitment and communication strategy. 3) In the collaboration stage, challenges involved fitting the contest design and problem to one another, creating structures for collaboration to enable knowledge sharing and manage various agendas, being open by sharing knowledge and information and to be open-minded to new ideas, and finally, to assess whether the problem is suitable for open innovation contests at all.

We have studied open innovation in a public healthcare case in this paper, but claim that the challenges are possible to generalize analytically to other public or private sector cases and setting. Analyzing the data in the previous section in the light of the theory supports this claim. However, it may be some aspects of a public organization providing healthcare such as power, politics and strong professional groups affecting e.g. the different aspects of the problem definitions and solutions, and the norms discussed above that can be domain specific.

The conclusions show the need to generate and analyze data from actors with several perspectives in the innovation contest. The identified challenges in this paper can also be viewed as an inspiration for further research directions and aspects to address from a practical point of view regardless of sector. Some practical implications that can be drawn based on this explorative study is that there is a need to address the problem space of an innovation contest thoroughly since this affects many other areas such as contest design, collaboration and the possibility to identify and attract participants.

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