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Innovation Bazaar: Organizing the Exchange of Hospitals' Local IT Innovations

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ABSTRACT

During the last decades, the software for supporting hospitals' information systems became more flexible in terms of adaptability and configurability. Some hospitals use these capabilities to create local IT innovations. However, information on these local IT innovations is rarely available, as a preceding Grounded Theory based study revealed. To tackle this shortcoming, a two year action research project with a major German hospital software vendor and its leading customers was conducted. In a first stage, information on local IT innovations among the vendor's leading customers was gathered and shared. In a second stage, a new position at the IT vendor (called 'innovation bazaar') was established to organize the exchange of information about these local IT innovations. As a result of the hospitals' positive feedback, the vendor is willing to make this exchange sustainable. It expects valuable input for product development, professional service and sales.

Keywords

User Innovation, Hospital IT, IT Innovation, Action Research, Lead Users

1. INTRODUCTION

Hospitals across the world strengthened their effort to supporting and optimizing their information processing and information management with the help of IT. During the last decades, the software for supporting the hospitals' information systems grew more and more powerful in terms of functionality (Haux, Winter and Ammenwerth, 2010; Winter, 2009). At the same time, the standard software systems widened their flexibility. The individual and local needs in hospitals require customized software. The vendors of those software packages addressed this need by providing advanced features for customization. Software components for general tasks like form editors, a workflow engines or complex reporting tools can be combined and configured to support unforeseen or local needs. Building and providing such an individual configuration is either done by the vendors' professional service or by the hospitals IT departments and IT users.

A preceding Grounded Theory based study revealed that some hospitals create their own IT innovations by customizing standard software or even by developing software completely on their own. However, these local IT innovations are hardly known by other actors. In this paper, we describe an action research based project, which aimed at gathering information about these innovations and share it with relevant actors. In a second step, the hospital IT vendor established a new position called 'innovation bazaar'. The assignment of this position is to manage the exchange of information about these local IT innovations.

In the second chapter, we briefly present a part of a preceding Grounded Theory based study. We focus on the pattern of local IT innovations. These results are the starting point for the action research based project. The third chapter describes the concept of an innovation bazaar, the two phases of this project, and its evaluation results. In the fourth chapter, the results are summarized and discussed. The paper closes with an outlook on future research in this field.

2. LOCAL IT INNOVATIONS: A PATTERN OF INNOVATION

In this chapter we describe 'local IT innovations' as a pattern of innovation in the system of IT innovation for hospitals in Germany. It is a small part of the results of a large Grounded Theory (Corbin and Strauss, 2008) based research project (Drews, 2011). The research project aimed at answering the question of how IT innovations are being developed and adopted in the system of IT innovations for hospitals in Germany.

2.1 The System of IT Innovation for Hospitals in Germany: Concepts, Method and Data

The systems of innovation approach delivers a core concept for this study: A system of innovation is, according to Edquist (2005, p. 182), defined as ‘all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations’. The system of innovation under study is bounded by the focus on hospitals in Germany as a context for IT adoption.

Within an iterative process of data acquisition and analysis, 16 transcribed expert interviews and 18 observation protocols from workshops, trade fairs, etc. were completely coded and analyzed. Furthermore, we analyzed 1700 documents like product brochures, journal articles, and web pages. The result of this analysis is a 140 pages Grounded Theory (Drews, 2011). It is structured by three main concepts: system of IT innovation, IT innovation project and IT innovation pattern.

An IT innovation pattern summarizes a number of similar IT innovation projects in a specific IT innovation system (Drews, 2011). It includes various project courses, which share essential characteristics (invariants). It also covers a number of different concrete forms (variants). The Grounded Theory study revealed nine major patterns of IT innovation. We focus on the pattern of local IT innovations here, as it describes potentials and shortcomings in the system of innovation relevant to the intervention project.

2.2 Local IT Innovations: A Pattern of IT Innovation

Most hospitals today use a large software product for the core functions of information processing. These systems consist of a large number of components. To cope with the needs of many different customers, they can be adapted to the individual needs. This activity is called customizing. The range of tools for customizing includes form editors, configurable reporting tools, workflow and path designer tools and embedded programming. The systems can be customized by the vendors’ service staff as well as by trained personnel in the hospitals. In smaller hospitals, these tools tend to be used by the vendors’ service departments. In hospitals with larger IT departments, these tools are often used by the hospitals’ staff. In some smaller hospitals, there may also be experienced people who acquired the knowledge needed for customizing. But there are also major hospitals, which decided that the customization of IT systems should exclusively be done by the IT vendors (e. g. as a part of outsourcing or application service providing contracts).

The customization options are so manifold, that hospitals can create IT innovations on their own. This is especially true for larger systems. The combination of various generic tools, such as form editors, workflow systems and work lists, may be used for supporting diverse tasks of information processing. In a first step, these innovations are context-specific solutions. In many cases, it turns out that the systems created in this way point at shortcomings in the functionality of the larger software products. If, for example, customizing is used to create new functionality to schedule chemotherapy treatment or to support tumor boards, the question may be raised why the underlying system does not provide this functionality as a part of the system. Vendors can benefit from these solutions by analyzing them and use them as an inspiration for their own product development. Sometimes, hospitals exchange information about the solutions they developed. But this is rather done randomly and only among a small number of hospitals.

Some hospitals go one step further and develop their own software to meet local needs, if a suitable system is not available at the market. Compared to customizing, the limitations of self-developed systems are lower. However, the integration with other system components is not as easy. In particular, Microsoft Office is often used to develop solutions based on Excel or Access, which are very closely adapted to the local requirements. As far as the employees have the required skills, they may also develop new applications based on ‘real’ programming languages like Java, .NET or PHP. For IT vendors, software development in hospitals is unwanted. The vendors consider this as their core competency. If the vendors are not capable to deliver what the hospitals demand, the vendor’s reputation may diminish.

The new systems, which are developed locally in hospitals, are well adapted to local requirements. Regarding their innovation characteristics, this is an advantage and disadvantage at the same time. On the one hand, the systems support the local needs well. On the other hand, a transfer to other hospitals is not easily possible, as these solutions only have a few customization options and the technical quality is often limited. This form of IT innovations is especially suitable in areas, where software vendors do not offer a solution and customers do not expect that this will happen in the near future. Software vendors may have good reasons for this behavior, as the requirements may be too specific and a change of the standard software is not considered to be worthwhile.

As mentioned above, IT innovation patterns are defined by certain invariants and variants. Below, table 1 and 2 list the properties of those factors forming the pattern of local IT innovation.

actors involved	in most cases: one single hospital
innovation activities	- planning is limited to a minimum and often short term - close to the problem of implementation - costs arise only in the hospital
communication and cooperation	- close agreement between the parties involved - often only a few people in a first step - intense intra-organizational cooperation
IT	smaller additional tools or applications
results	- a high degree of problem solving can be achieved through close coordination - participants identify with the result - later, these innovations may be replaced by standard software

Table 1. Invariants in the Pattern ‘Local IT Innovation’

problem	- broad spectrum - often a local problem or area, in which standard software has shortcomings
actors involved	- employees from different departments - with or without involvement of IT staff - good knowledge of the development system (standard software, programming language, office system) supports this pattern
innovation activities	- customizing of standard software - in-house developments on the basis of office software or development environments / platforms
innovation barriers	- internal policies and regulations that seek to standardize IT or treat in-house development and customizing as something negative - not enough dedicated staff - inadequate resources for the IT
interferences	- reorganization in the hospital often requires quick solutions that can be developed only in a local IT innovation - reorganization activities of the IT vendors foster local IT innovation, because it is not always fast enough to provide a suitable solution available

Table 2. Variants in the Pattern ‘Local IT Innovation’

To summarize, the pattern of local IT innovations leads to the following need for action: Hospitals use the possibilities to customize the systems intensively to develop innovative solutions. This is often an ‘emergency’ activity, because the big vendors are not reacting flexible enough to the customers’ demands. Communication on these local IT Innovations is rather uncommon so far. As a result, they will rarely be considered in the development of large software systems.

3. DISCOVERING AND MANAGING LOCAL IT INNOVATIONS: RESEARCH APPROACH, PHASES AND RESULTS

Considering the shortcomings in the distribution and use of local IT innovations described above, we identified several concepts from literature, which support our problem description (3.1). To tackle the shortcoming, we planned and realized an action research project (3.2). In the first phase, the hospitals’ local IT innovations were revealed (3.3). The second phase aimed at anchoring the exchange of information about these innovations at the IT vendor. First, the concept of an innovation bazaar was developed (3.4). Afterwards, this concept was presented and discussed at another workshop (3.5).

3.1 Underlying Theoretical Concepts: Users as Innovators

Several concepts from innovation research, mainly by Eric von Hippel and Henry Chesbrough, inspired the project and the innovation bazaar concept: user innovation, lead users, free revealing, open innovation, and sticky information.

Eric von Hippel revealed the importance of users in the innovation process for several industries (von Hippel, 2005; von Hippel and Katz, 2002). Especially for IT, he stressed the far-reaching possibilities of the user, to even actively develop

innovations (user innovation). In an earlier work, Eric von Hippel highlighted the role of lead users within the innovation process. These users are considered to be a major source of innovation in their domain (von Hippel, 1988). Applied to the present case, the local innovations in hospital IT, this turns the focus particularly on the leading users of hospital IT and their self-developed IT innovations. According to the lead user concept, these hospitals are a suitable target group for activities, which aim at raising the potential of local IT innovations.

Moreover, users are often willing to demonstrate their own innovations to others. According to von Hippel (2005) this is called 'free revealing'. This behavior is motivated by the acknowledgement, innovators can earn for innovations. Often these innovators are even willing to share their ideas for free.

The fourth important concept is the open innovation approach (Chesbrough, 2003; Chesbrough, Vanhaverkeke and West, 2006). Its main idea is, that vendors can benefit, if they take up ideas from outside the company and use them as a source for development. This concept demonstrates who may benefit from a systematic uncovering of local IT innovations: Hospital IT vendors may use these systems as a stimulus for their product development.

Additionally, the importance of sticky information (von Hippel, 1994) highlights the reason for the local IT innovations' success. IT development and IT users are located close to each other during the development project. Hence, the sticky information can be taken into account by the developers easily. Furthermore, it also points out, that the revealing of local IT innovations can be quite a laborious process, since context-sensitive information has been incorporated into their development (von Hippel, 1994).

3.2 Research Approach: From Analysis to Intervention

These considerations on the deficits in the innovation pattern of local IT innovations in combination with the concepts from innovation research lead to the idea of conducting an action research-based intervention project. This project aims at overcoming the information deficits on local IT innovation and fostering their further use. It addresses the research question of how the results of the Grounded Theory based analysis may be used for an intervention project to improve the system of IT innovations for hospitals in Germany. The focus in this paper lies on the pattern of local IT innovations.

The consulting project was conducted by the author in the role of a researcher on behalf of the software vendor. It is based on the action research methodology (Baskerville, 1997; Baskerville, 1999; Baskerville and Wood-Harper, 1996; Susman, 1983). The project went through two cycles: The GT-based study and theoretical concepts for user innovation correspond to the diagnostic phase in action research. The following steps of action planning and execution ('taking action') are in line with the planning and implementation of the first workshop. The evaluation of the first intervention ('evaluating'), and their findings ('specifying learning') are described in section 3.3. The results of the first cycle were used to create a more refined diagnosis for the second cycle. The plan of the second cycle mainly aimed at institutionalizing the exchange of local IT innovations (see 3.4). Again, a workshop was organized and evaluated. The results contributed to the learning process (see 3.5).

The idea of revealing local IT innovations was discussed with the employees of an IT vendor at a trade fair for health care IT. The vendor conducted a meeting to discuss and prepare the next annual meeting with its reference customers. We attended this meeting and presented our idea of performing an innovation workshop at this meeting. The IT vendor has a dedicated reference customer program. These customers represent the leading-edge use of the vendor's products. They are also involved in product presentations for regular and new customers. At the annual meeting, the reference customer hospitals as well as the leading staff of the IT vendor discuss strategic issues relevant to the long term relationship of both parties. CIOs, executive IT staff and (in some cases) CEOs represent the hospitals at this workshop. This reference customer meeting would provide, as the discussion with the IT vendor showed, a suitable place for the initial workshop. The planning and implementation of this workshop is described in section 3.3.

The positive response by customers at the first workshop and the request for a continuation of these activities lead to another discussion with the vendor. A second consulting project aimed at finding out, if it is possible to establish a long-term management for local IT innovations and how it can be initiated. In this second phase of the project, the IT vendor recruited a person, which should deal exclusively with this task. The preliminary plans and the realization of the second workshop are outlined in sections 3.4 and 3.5.

The first project phase began with a discussion of the idea of an innovation workshop at the reference customer meeting in April of the first year. Afterwards, the preparatory activities for the workshop began. The workshop took place in June. The second phase of the project began in January of the second year, when the IT provider started its activities to establish a permanent exchange of information about local IT innovations. This phase ended with the second reference customer workshop in June.

The project can be located as an intervention on the actor and arena map (Clarke, 2005; Drews, 2011) developed in the GT-based research project (marked in red in Figure 1). The intervention was conducted by a researcher. He needed to cooperate with a hospital IT vendor. In a next step, the customers of the focal hospital IT vendor are involved.

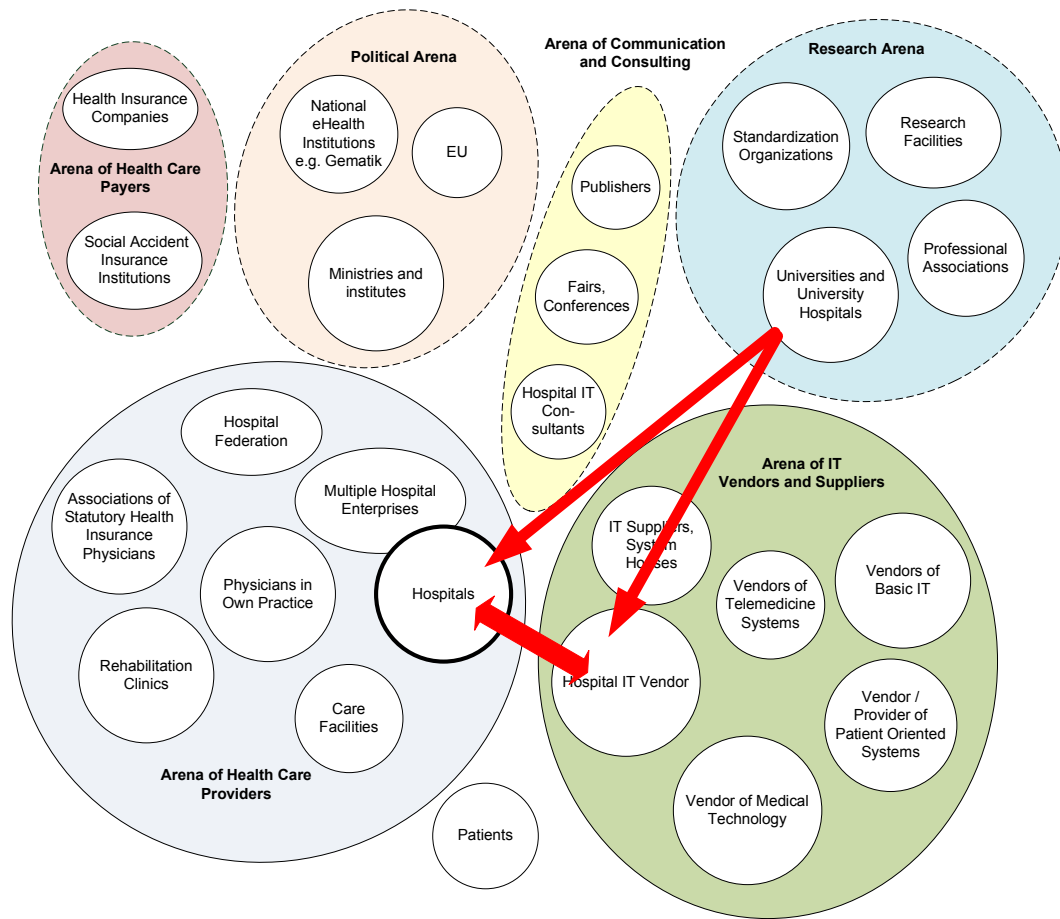


Figure 1 - Map of Actors and Arenas: Intervention in the System for IT Innovation in German Hospitals

3.3 Phase 1: Innovation Workshop for Revealing Local IT Innovations

At an initial meeting with staff from the IT vendor, the idea of revealing and utilizing local IT innovations was presented. After some discussion, a person who was responsible for organizing the reference customer meeting suggested that a session should be reserved for this topic. A concept for conducting this session should be developed.

This concept included the idea of sending a questionnaire to the participants from the hospitals, who are registered for the workshop. In this questionnaire, the customers should shortly describe their local IT innovations. An evaluation of feedback should then indicate, whether suitable ideas are reported, which are good enough to be presented at the workshop.

After an agreement on the concept was reached, the questionnaire was developed. It should serve as a basis for questioning the hospitals. The IT vendor sent it along with a cover letter to the customers by e-mail. The response rate was initially low, but it could be improved by individual telephone calls. In total there were 22 responses from seven customers. The responses were transferred into a list to get a better overview.

Four customers were selected to present their solutions at the workshop. As the innovations varied regarding their complexity and size, especially those customers were selected, who had developed the more demanding systems. Each of them should present three innovations at the workshop. These customers were asked to describe their solutions in about 15 minutes. After

each talk, time was scheduled for discussion. As the IT vendor currently offers several product lines for hospitals, at least the two most important product lines should be represented. All invited customers agreed in presenting their solutions at the workshop.

The whole workshop was planned to last three days. During this period, two hours were reserved for the innovation workshop. After an introductory talk on the theoretical concepts by the author four customers presented their solutions. The participants intensively discussed what they have seen. It became clear, that other customers had dealt with similar problems and some of them had also developed their own solutions. The workshops' participants received a complete list of the local IT innovations that were submitted. The list also included the contact details of the responsible people in the hospitals, so that a direct contact could be established, if a hospital is interested in a solution of another hospital.

The session was evaluated by a questionnaire at the end of the event. In total there were 23 responses. On a scale from very good (= 1) to worst (= 5), 11 participants rated the forum as very good and 12 as good. This gives an average of 1.5. The feedback showed that the customers were very interested in this topic.

In the discussion at the end of the workshop, the customers asked the vendor to arrange a permanent exchange of information on the local IT innovations. A senior executive of the IT vendor agreed in taking up this task. However, no precise statements were made on how this exchange should be organized.

3.4 Planning phase 2: the innovation bazaar concept

The positive evaluation of the first workshop and the commitment from the IT vendor to pursue this matter further, led to several activities in the following months. The IT vendor hired a new staff member, who should attend primarily to establishing an information exchange for local IT innovations. And secondly, a follow-up workshop was organized. This workshop focused on the plans to establish the so called 'innovation bazaar'. Additionally, further local IT innovations were presented and discussed. We advised the IT vendor for the new position's tasks, its integration into the company, and the organization of the second workshop.

The new employee was trained in the subject of local IT innovation. She examined existing documentation. Afterwards, she was assigned to identify further local IT innovation. She contacted the participants of the last reference customers' workshop as well as other customers, who do not belong to the circle of reference customers. The latter were chosen on the recommendation of colleagues. The query on further IT innovations was mainly done by telephone. She visited some customers to analyze and document the local innovations on-site.

Two workshops with the vendor were conducted without customer involvement to discuss the inclusion of further organizational units. In addition to the person who organized the reference customers' meeting, the new employee and an employee from the development department took part in these workshops. They had previously discussed the chances and risks with sales and service staff. It turned out, that comprehensive descriptions of IT innovations as well as a classification of those innovations were required to keep up with an increasing number of solutions. The employees from the development department provided a prototype database for organizing the information. The result of these two workshops was a concept and a project plan.

As already deduced from the theoretical concepts of lead users, these customers are assumed to be an essential source for local IT innovations. Furthermore, they are potential buyers for ideas from other customers, because they often have the know-how to transfer these solutions or to rebuild them on their own. The course of investigation showed, that a significant number of customers outside the group of reference customers also develops local IT innovations. For example, one customer employs a former employee of the vendor. He uses the experience he gained during his employment in the service department to develop innovative solutions. At the same time, non-reference customers are also potential customers for the local IT innovations. Customers should contact the innovation bazaar, if they have developed or if they are planning to develop a new local IT innovation. Additionally, they should be able to query the innovation bazaar whether a local innovation from another hospital is available elsewhere, which addresses the same problem.

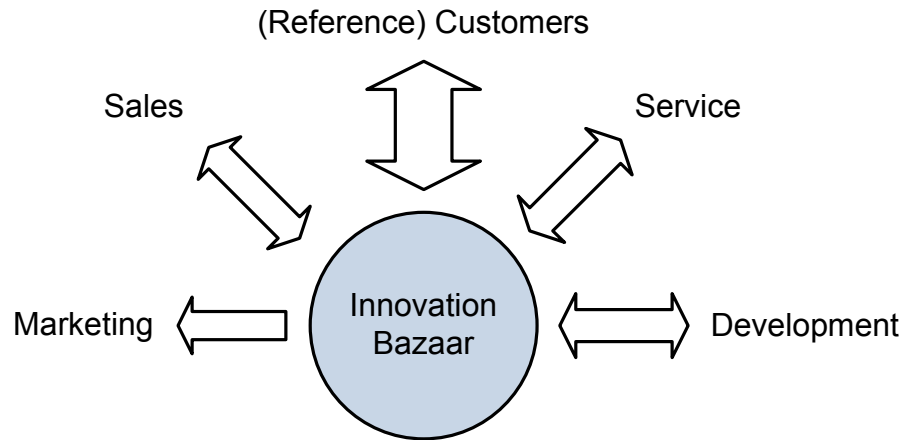


Figure 2 - Innovation Bazaar as the Hub for Information about Local IT Innovations

The systemic collection and processing of information on local IT innovations at the central innovation bazaar turned out to be valuable for a variety of stakeholders. To organize a sustainable exchange of local IT innovations, a suitable anchorage of the processes and responsibilities is required. Ideas, which have already proven in a hospital, are a valuable inspiration for the vendor. The development department should therefore be informed about new local IT innovations by the innovation bazaar. Also, the development department can provide relevant input, for example the plans for further product development. They can also inform the innovation bazaar about the fact, that a certain requirement is already listed in the backlog.

For the sales department, the innovation bazaar may be a source of information, because the way, a problem has been solved, can be interesting for more customers. The sales people are close to the customer and their problems. They can directly ask the innovation bazaar, whether a solution for a particular requirement has been developed for another customer. The professional service department staff, which provides service and consultancy for the customers, are also interested in these solutions. They may generate further service engagements on the basis of the local IT innovations. As a part of these orders, the employee can then, for example, transfer the solution from one customer to another. During this transfer the solution may need to be adapted to the other customer's requirements. At the same time, the service employees develop innovative solutions in their projects that can be a template for solutions for other customers. The innovation bazaar can also be a relevant source of information for the marketing department. They may use the documented IT innovations to create a success story together with a hospital, which emphasizes the system's flexibility. However, they have no own contributions to the innovation bazaar.

3.5 Phase 2: Follow-up Workshop and Anchoring at the IT Vendor

Until the following reference customers' workshop, the new employee documented and categorized 50 local IT innovations. This number is significant, as in this second phase the focus was limited to one of the vendor's product lines. The reason for this decision was the end of life of one product line and the scale of another product line. The latter was developed globally, so that specific requirements from single countries and customers only had a very low chance to be realized. If the information about local IT innovations for this system had been collected, it would presumably have only little impact. The vendor wanted to avoid this impression.

On the follow-up workshop, the vendor presented a list of all 50 innovations to the customers. Additionally, the new employee was introduced as a contact for the exchange of information on local IT innovations. The plans for the innovation bazaar were presented to the customers. Participants also evaluated the second workshop. Overall, 16 people filled out the evaluation form. The scale ranged from very good (= 1) to worst (= 5). Twelve people rated the content of the workshop as 'very good' and four as 'good'. This gives an average rating of 1.25. Compared to the first workshop, the result could be slightly improved.

4 RESULTS AND DISCUSSION

In this article, we describe the planning and implementation of an action research-based consulting project for local IT innovations in the IT innovation system for hospitals in Germany. As these innovations were only poorly understood, rarely analyzed and seldom incorporated into other IT innovation projects so far, an action research-based project was conducted. In the first phase of the project, the hospital employees showed their interest for this topic. The project was characterized by active participation of the lead users and the IT vendor. It earned positive evaluation results. In the second phase of the project, the structural conditions for the institutionalization of information sharing on local IT innovations were created.

The positive feedback from customers and the institutionalization of the innovation bazaar show that the actors see a benefit in the involvement of customers. Before this project, the IT vendor did not exploit the potential of local IT innovations sufficiently. It has become clear, that a variety of stakeholders has to be involved in the process of information gathering and sharing. The information may then be used by another set of actors to improve the products and services.

With the establishment of a central point of contact for the exchange of information on local IT innovations, the IT vendor has made a first step towards a sustainable coordination. It has become clear, that there is only a little incentive for the individual customer to make their local innovations known or to even sell them. The opportunities for the vendor justify the needed effort, as the gathering of information is a demanding task. With the documentation of the first 50 IT innovations, the IT vendor and its interested customers have a first pool of information. It is not clear, whether the vendor will fund the newly created position in the long run. On the one hand, the exchange of local IT innovations seems to have a great potential. On the other hand, it is unclear until now, whether the other departments realize the added value.

5 OUTLOOK

The consultancy project has been limited to a single hospital IT vendor. Future projects could start similar projects with other vendors. Although the findings suggest that managing local IT innovations was improved, it should be the subject of further research. Comparing these projects could then lead to an intervention pattern, which describes a generalized procedure for raising the potential of local IT innovations.

For the future, it remains open, whether the new structures are sustainable or not. This may be the subject of a follow-up study. Furthermore, the concept of an innovation bazaar described in this paper should be evaluated in other systems of IT innovation.

REFERENCES

1. Baskerville, R. L. (1997) Distinguishing Action Research From Participative Case Studies, *Journal of Systems and Information Technology*, 1, 1, 25-45.
2. Baskerville, R. L. (1999) Investigating Information Systems with Action Research, *Communications of the Association for Information Systems*, 2, Art. 19.
3. Baskerville, R. L. and Wood-Harper, A. T. (1996) A Critical Perspective on Action Research as a Method for Information Systems Research, *Journal of Information Technology*, 11, 3, 235-246.
4. Chesbrough, H. W. (2003) *Open Innovation - The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston, Mass.
5. Chesbrough, H. W., Vanhaverkeke, W. and West, J. (Ed.) (2006) *Open Innovation - Researching a New Paradigm*, Oxford University Press, New York.
6. Clarke, A. E. (2005) *Situational Analysis - Grounded Theory After the Postmodern Turn*, Sage Publications, Thousand Oaks.
7. Corbin, J. and Strauss, A. L. (2008) *Basics of Qualitative Research – Techniques and Practice of Systems Design*, Blackwell, Cambridge.
8. Drews, P. (2011) *Branchenspezifische IT-Innovationssysteme: Von der Analyse zur Intervention – Am Beispiel des Innovationssystems für Krankenhäuser in Deutschland*, Dissertation, University of Hamburg, Department of Informatics.
9. Edquist, C. (2005) Systems of Innovation – Perspectives and Challenges, in Fagerberg, J., Mowery, D. C., Nelson, R. R. (Eds.) *The Oxford Handbook of Innovation*, Oxford University Press, Oxford, 181-208.
10. Haux, R., Winter, A., Ammenwerth, E. & Brigl, B. (2010) *Strategic Information Management in Hospitals - An introduction to Hospital Information Systems*, Springer, New York.

11. Susman, G. (1983) Action Research - A Sociotechnical Systems Perspective, in Morgan, G. (Ed.), *Strategies for Social Research*, Sage Publications, Newbury Park, 95-113.
12. von Hippel, E. (1988) *The Sources of Innovation*, Oxford University Press, New York.
13. von Hippel, E. (1994) 'Sticky Information' and the Locus of Problem Solving - Implications for Innovation, *Management Science*, 40, 4, 429-439.
14. von Hippel, E. (2005) *Democratizing Innovation*, MIT Press, Cambridge, Mass.
15. von Hippel, E. and Katz, R. (2002) Shifting Innovation to Users via Toolkits. *Management Science*, 48, 7, 821-833.
16. Winter, A. (2009) The Future of Medical Informatics - Some Perspectives of Intra- and Inter-institutional Information Systems, *Methods of Information in Medicine*, 48, 1, 62-65.