A reflection on openness in collaborative product development

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Abstract: This paper presents an in-depth case study from a development project in the bank sector. The findings have implications for companies that consider openness in their innovation activities. A large company that wishes to involve suppliers, partners, customers and end-users need to be prepared organizationally, with e.g., motivated individuals, and allocated budgets. This applies regardless company size, but, the study indicates that a smaller firm can more easily involve end-users, and can take advantage of its (built-in) proximity and flexibility towards customers. By knowing more and by planning for openness in a product development project, the expectations of involved parties can more easily be met. The indepth case study illustrates that openness in innovation takes time, and requires efforts, and should not be undertaken unless the company is well prepared for it.

Keywords: Open innovation; user-driven innovation; bank IT systems; business development; SME involvement; users centered design; agile development

1 Introduction

Research on how companies involve external parties in their product development and innovation activities is extensive. In most cases, openness is put forward as an opportunity and sometimes even a necessity for competitively addressing customer future needs (von Hippel 1988, 2005, Quinn, 2001, Chesbrough 2003). In the bank sector, recent research has pointed to the fact that small firms could profit from an enhanced
relations for their business development, e.g., international expansion (Lindstrand and Lindbergh 2011), but that this requires a faithful relationship (Vegholm 2009, Storey and Greene 2010). With empirical evidence from an open innovation R&D project with the objective of developing a future ICT system for small and medium-sized enterprises (SMEs) as bank customers, this paper seeks a deeper understanding of the pros and cons of openness in collaborative product development between a company, its partners, and its customers.

Collaborative product development is not at all a new phenomenon, but a well-known practice for large complex systems development such as aerospace systems, or automotive (Hamel and Prahalad 1989, Clark and Fujimoto 1991). Supplier involvement can be regarded as a special case and has attracted a vast amount of research with the aim of developing better work practices for a customer who manages supplier relationships with managerial support for inter-organizational learning (eg. Helper 1996, Bruce, Leverick, Littler, Wilson 1995, Lambert and Cooper 2000). Nonaka (1994) systematically conceptualized tacit and explicit learning and the need of making explicit knowledge created within and outside the organization. More recently “open innovation” is to some extent replacing the traditional collaborative product development notion (Chesbrough 2003). While the product development literature often starts from a process view, with a focus on how to improve the efficiency, with eg. information technology tools and methods, in terms of how activities are carried out, and the resulting developed product or service, the open innovation literature takes more of a relationship perspective to partners, customers, and advanced end-users, and is closer to the supply chain view (eg. Lambert and Cooper 2000). However, it can be argued that the more recent open innovation research stream is studying quite the same phenomenon as supplier involvement, but with a new label (Groen and Linton 2010, von Hippel 2010).

The research presented in this paper is based on the extensive literature from these streams and the objective is to gain a deeper understanding of the pros and cons of openness in collaborative product development between a company, its partners, and its customers. We start by describing the design and research methodology of the case study. Then we account for the empirical work done with the different stakeholders, our analysis of outcomes in terms of common understanding and expectations of the benefits of the new ICT system, and the way the system was envisioned in scenarios and prototypes. We report our findings in respect to the role of openness from the different stakeholders and draw a set of conclusions in relation to what earlier research has found, and how our findings confirm and may articulate some of those general findings.

2 Design and research methodology of the case study

**Overall design of the inter-disciplinary case study**

The underlying initiative for this research was to conduct an open innovative project in the information and communication technology (ICT) area as an indepth case study (Yin 1989) with active participation of the researchers (Gummesson 1988). This particular case study originates from an experimental initiative by the Swedish Governmental Agency for Innovation Systems (VINNOVA), which they referred to as “the catalyst process”, with the objective of uniting new partners from academia and industry for an
innovative research and development project in the ICT area (in the broad term, not only referring to technology). Initial partners were selected based on their interest to seek new knowledge on the innovation process. In this novel research articulation phase, the governmental agency openly called partners in academia and industry to join. After five workshops with many different participants, the idea from one of the large commercial banks of Sweden to develop a “Business Navigator” was selected to proceed with, and resources from the state agency, academic research institutions, and two partner banks; the large bank, and one of its many smaller partner banks, was allocated for an R&D project with this goal. The development team that hence was formed consisted of representatives from the two banks, and researchers from three universities; the governmental agency representatives no longer taking an active part in this phase. Team members from the large business bank represented the R&D department, the IT development department (esp. the User Interface Group), and the business development department, and the project had direct support from the bank’s top management. From the small bank the managing director and the manager for corporate banking participated in the team. The researchers represent three fields: Industrial Engineering and Management (IEM), Strategic Management (SM), and Human Computer Interaction (HCI). As a next step, the team chose development and user involvement methods for the work, and selected additional partners, representing different types of prospective systems users, to involve in the development work. The users were selected through purposive sampling (eg. Eisenhardt and Graebner 2007) to represent target users with various levels of pre-understanding of ICT tools for business development.

The articulation phase of the project had resulted in different, but closely related research questions for the different discipline involved. The questions regarding IEM aspects of SME business transformations centred on the new business opportunities for the SME customers, e.g. how they could move from goods-centered to service-centered production, how they could apply new business models that supported such transitions; and how they could gain from benefits of networked cooperation, specifically how they could apply new ICT support in such cooperative efforts. These were the central questions in regards to open innovation. What kind of openness would the participating SMEs show towards the banks’ out-reach efforts? Would they welcome and go along with the banks’ networking initiatives, and what role would they accept for the bank as the central node in such a common business supporting network?

Within this broad frame of SME business transformation, the questions regarding SM aspects centred on investigating the current work practices of corporate advisors in respect to SME business opportunities and to what extent these practices were, or were not, supported by the bank’s current ICT services. Together with initial findings regarding SME business transformation, the investigation on work practices (reported in Demir 2010) provided the socio-economic basis for a set of HCI related questions on how work practices and new ICT services could enhance the responsiveness of advisors to SME participation business the envisioned business supporting network.

Along the timespan of the project, the participating researchers carried out more than seventy interviews with representatives from different actors, and a large number of workshops with developers and different prospective system users. At the end of the project, the concrete results, in the form of a demonstrator package for ICT systems development at the large bank, was reported on, and all other partners were interviewed about the outcome of their involvement. Activities were documented (text, photo, video), and all interviews were transcribed, enabling a thorough analysis in retrospect.
Agile development and HCI challenges

One of the main methods applied by the team was the agile development method SCRUM, one of the team leaders from the large commercial bank being a certified SCRUM masters. However, the method had just recently been introduced and was not slavishly followed, a fact that allowed some modifications according to the needs perceived by the project team.

A key question from the HCI research point of view was formulated: when designing a new bank service, how to concurrently design new work routines and enabling ICT services? With positive experiences from having explored design patterns as a way to conceptualise proven design solutions (van Welie and van der Weer 2003, Walldius and Lantz 2011) a tentative hypothesis was formulated: *design pattern maps can help conceptualise the new bank service in the ongoing dialogues between stakeholders* that would guide the design of the new ICT system. The key challenge, it was assumed, would be to engage the participating SMEs in constructive, critical discussions on how their preferred social and economic benefits could be enabled by suitable interaction design solutions. This stress on awareness of the interplay between social, economic, and technological factors was inspired by the Value Sensitive Design (VSD) approach (Friedman et al. 2008) that calls for a three tier approach in ICT design – *conceptual, social and technological investigations* have to be carried out in parallel in order to support ongoing stakeholder deliberation on the pros and cons of different design solutions. Our contribution to this approach in the case study was to try out *design pattern maps as the conceptual tool* for keeping the deliberations focused on how the technological (interaction) design solutions would match the social (and economic) values declared by the SMEs and the two participating banks.

3 Empirical/Case description

Social investigations informing conceptual design

To investigate the social and technological aspects of the corporate advisors’ ICT usage, a total of 76 in-depth interviews were conducted with 44 informants. Interviews ranged from 45 minutes to 120 minutes each. All interviews were tape-recorded and almost all interviews were transcribed verbatim. The interviews were complemented with a *diary exercise* investigating work tasks, ICT support, and strategies to cope with critical incidents. The main subject matter of the interviews with advisors focused on existing credit procedures and the overall operational and user needs pertaining to ICT support. The results from these investigations was further analysed in a *flow chart analysis* of the credit workflow with problem areas identified (an example is shown in Figure 1).
Figure 1 Example of flow chart analysis with activities (arrowed boxes) and decision points (diamond symbol), this example shows the interaction between (1) client company, (2) business consultant, and (3) bank.

The commercial bank was responsible for the ICT development for the whole network of savings banks and, at the time of the project’s initiation, the bank was transforming its ICT development methodology from using a tailored version of Rational Unified Process to applying agile methods, thereby foregrounding an enhanced user participation and shorter iterations in the development cycle. This meant that a certified Scrum master joined the project group and that the project acquired the status of a pilot for internal Scrum method development. Three Scrum seminars further articulated the definition of problems and possible solutions identified in interviews and diaries.

The Scrum seminars, in which researchers, Scrum master and consultants, corporate advisors and representatives from the bank’s project leadership participated, resulted in a set of user stories, i.e. requirement specifications formalised as modular user requests detailing motivation and stakeholder values (Table 1). This allowed the team to receive the first round of stakeholder feedback on problem-solution definitions as SME customers and advisors validated a set of 12 user stories. Ten of the 12 user stories received unanimous support from both SMEs and advisors, a result that gave the prospective service its first outer contour.
Table 1 User stories developed in the project

<table>
<thead>
<tr>
<th>User story</th>
<th>Company opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a customer, I want to …</td>
<td>(four companies numbered below)</td>
</tr>
<tr>
<td>… be able to upload my SIE file so I can get visual overviews of my company’s business and do analysis and “what if” simulations income and balance sheet.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… get information about my industry sector in Internetbanken so I have all information in one place and can compare my performance with the sector average.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… get reminders about loans and interest rates due so I can pay them well in advance.</td>
<td>1. No, 2. No, 3. No, 4. No</td>
</tr>
<tr>
<td>… get reports on Value Added Tax for the monthly VAT declarations.</td>
<td>1. No, 2. No, 3. No, 4. No</td>
</tr>
<tr>
<td>… get estimates on how well the bank can finance my investment compared to other alternatives.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… get the bank’s evaluation of how well I manage my business.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… be able to simulate different scenarios, like machine-, training-, quality- and sales initiatives without having to send or save the results if I don’t want to.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… be able to save my simulations as background material for my next meeting with the bank.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… get in contact with new partners in order to make joint bids and expand my business.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. (Maybe)</td>
</tr>
<tr>
<td>… get advise about minimum margin for my company as a whole in order to decide which margin to ask for specific customer order.</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… get advise about customer selection and specific business conditions for that customer in order to reduce business risk (risk not being paid).</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
<tr>
<td>… get an overview of all my communication in my customer folder (web-based) at the bank in order to increase information efficiency and reduce risk of misunderstandings</td>
<td>1. Yes, 2. Yes, 3. Yes, 4. Yes</td>
</tr>
</tbody>
</table>

Source: This is the style for sources.

Interviews, focus groups and design workshops to articulate design solutions

The methods for attaining the integration of social and technical investigations called for by Value Sensitive Design was a combination of contextual interviews, focus group meetings and design workshops which were carried out over a period of 14 months with all parties involved. Prototyping work was performed employing design pattern use for visualising and communicating prospective design solutions, scenario techniques for testing sets of design patterns as they were hypothetically implemented, and layered design pattern maps.
Based on the validated user stories four design workshops were arranged on site at four SMEs, which represented important market segments for the local savings bank (manufacturing, tooling, technical services, and administrative services). In cooperation with two of the researchers and the Scrum master, each executive produced paper mock-ups in order to explore and articulate the design space staked out in the top three user stories (Table 1). This collaborative reflection on paper mock-ups concluded the initial phase of user context investigation and narrowed down the design space in the following respects:

- the Business navigator application should be accessible on the web and on mobile phones;
- the application should be possible to run both online and offline;
- it should enable SMEs to input a broad range of data relevant to their business development;
- the sharing of SME and bank data should be guided through user profiles negotiated with each individual SME and supplied by the bank;
- access should be enabled on negotiation to both the same and to private screens for both advisor and customer;
- the initiative to propose, or pose questions about, new business measures was anticipated to come mainly from the bank as an effort to acquire a more proactive stance towards its SME customers;
- there should be provision for performing simple what-if analysis; and
- visualisation support should be given whenever relevant.

Throughout the Scrum seminars and design workshops, the dialogues with corporate advisors and bank customers had been revolving around problem-solution pairs, the core construct of design patterns. In order to summarize the essential social and technological aspects of the design work, as called for by the VSD approach, a first design pattern map was drawn. Here, the layering idea, proposed by van Welie and van der Weer (2003) was applied according to the popular strategy map format (Kaplan and Norton, 2001). This format prescribes that positive value, effect, and development descriptors (in this case also design pattern names expressing candidate or proven solutions) should be drawn with cause-and-effect lines connecting strategic linkages between values-effects-and-development initiatives. Thus, the essential social and technological aspects of the preliminary Business Navigator design was summarizes in terms of, from the top:

- the desired stakeholder values afforded by the new service,
- effects in the business processes at the savings bank that could manifest those values,
- new work routines that could enable those effects, and
- the needed technological solutions that could enable those new work routines.

The map was presented and discussed, both with the board of directors at the savings bank and in a project coordination meeting at the commercial bank. The participants at both these occasions were familiar with the Balanced Score Card and Strategy map formats, therefore they recognised the potential of the map as a useful summary for all stakeholders concerned. Although the feedback was favourable, this was a first attempt to summarize values, effects, and candidate design solutions, and as the map neither had cause-and-effect linkages, nor specifications of entities (measurements, targets, and initiatives; and for design patterns concise problem, forces, and solution definitions) the map did not generate any inquiries regarding essential design decisions.
Social and conceptual investigations informing scenarios and a Business Navigator demonstrator

The first phase of social and organisational investigation informing conceptual design propositions resulted in the recruiting of three master students from the fields of economics, design, and human computer interaction for further prototyping and design of a demonstrator package. This amounted to a second test of the design map idea as it became input material bringing order and a sense of overview to the quite extensive interview and diary results, and how it was conceptualised in user stories, video footage from the SME design workshops’ prototyping sessions and the resulting BN mock-ups.

The prototyping work was organised as a pilot Scrum prototyping project at the commercial bank, led by the Scrum master and with the project coordinator at the commercial bank, the HCI researcher, and two external consultants (currently working with the bank’s User Interface group) as resource persons. The work was organised in three six-week sprints, each ending with a focus group meeting at the savings bank for evaluating the results by SMEs and corporate advisors. In turn, each focus group meeting was followed by a design workshop at the commercial bank for evaluating the feedback and critique as input to the next sprint. The focus of sprint 1 was user interface sketches of the Business navigator service, an exercise that gave the students a chance to interpret and formulate their own understanding of the Business navigator concept and to encounter all the different stakeholders involved in the project. This paved the way for sprint 2, focussing on workflow scenario, and for sprint 3 focusing on new workflow scenarios with user interface solutions which were in line with the bank’s new widget platform.

4 Analysis

Practical implementation lessons

The broad participation of bank management, employees and SME customers in seminars, workshops and focus group created a common understanding and respect for the different needs of different stakeholders. The common understanding of mutual benefits to be gained is an important result, it paves the way for a continued customer involvement in the implementation phase, not only of the Business navigator concept but of other user centred, light weight projects. This was in part made possible by the prioritized development effort – not on ICT side but on new work routines for SME customers and bank advisors.

We conclude that employing design pattern maps for ongoing collaborative articulation of new work routines and enabling ICT services can be a key activity for creating and maintaining a shared understanding between stakeholders with diverse expectations of how new ICT services can enable new ways of working. One of the most important, and perhaps most surprising findings was that it became evident that, for a system of this kind to be embraced by the SMEs, the main dialogue partner for individual SMEs might not be the savings bank. The prospective SME users’ interest for using the service together with their employees and partner SMEs was far greater than the prospect of having a centralised service focusing mainly on bank-SME dialogues.
We feel that it is important to note that a prolonged period of “matchmaking” was a prerequisite for the inter-disciplinary exchange between our three fields of study, for the active participation of master thesis students from two of these fields and for the high level of participation in the study of management and corporate advisors from the bank and from the SME customers. For the HCI researcher in the case study, the VSD approach was instrumental in helping to integrate conceptual design into socio-technical investigations together with colleagues and students from the IEM and SM fields.

5 Findings

New product development in the ICT intensive bank sector is usually a rigid process, restricted by rules and regulations. Methods for open innovation are therefore not easily adopted, neither is agile software development methodology. The research presented in this paper puts forward a number of important contributions on the pros and cons of open innovation. An observation was that the time and effort that was put into the project varied for the different parties over time.

The evaluation of the project pointed at the need of common motivation and understanding for participants in the collaborative product development team. Without a thorough preparation and abundantly allocated resources an open innovation project might fail to meet expectations of involved potential and current users. In the project the large bank chose to involve indirect customers. It appeared more feasible for the small bank to approach customers for experimental development. An observation was that the involved potential users became ambassadors for the large bank. In an organized way, these potential users themselves tested ideas and collected new development ideas for the project. Further, the large bank’s own IT development personnel were reluctant to drive the development, afraid that they were too much “locked in” current solutions. Instead, they preferred to involve young consultants and students for the experimental development. Moreover, it was difficult to find the time needed internally at the larger bank to strictly follow the SCRUM methodology between IT development and business development departments. At the end of the day, however, the project was estimated as highly successful for all involved parties, although requiring a large amount of resources.

6 Contribution

The main contribution of this study is that it confirms some of the strengths of open innovation, but also puts the finger on important weaknesses and traps that needs to be taken into consideration when applying, or suggesting, openness in product development.

The findings have implications for companies that consider openness in their innovation activities.

Our findings also indicate the need for supplying the parties involved with ‘low-threshold’ tools as grammars for joint innovation. More specifically, the use of simple mind-map techniques, such as the use of post-its and pre-stated sentences for usability features in the new software, bank customers as well as corporate advisors and other bank representatives can jointly address features of the new software without having to deal with syntactical and semantic misunderstandings. Thus, we subscribe to the large corpus
of literature on the necessity of a common language and material tools that help bridging epistemological boundaries in collaborative projects (e.g., Star and Griesemer, 1989).

A large company that wishes to involve suppliers, partners, customers and end-users need to be prepared organizationally, with motivated individuals, as well as in terms of allocated budgets.

This applies regardless company size, but, the study indicates that a smaller firm can more easily involve end-users, and can take advantage of its (built-in) proximity and flexibility towards customers.

By knowing more and by planning for openness in a product development project, the expectations of involved parties can more easily be met. The indepth case study presented in is paper illustrates that openness in innovation takes time, and requires large efforts, and should not be undertaken unless the company is well prepared for it.

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