Integrated Development, Use and Learning in a Co-design Setting: Experiences from the Incremental Deployment of e-Me

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Abstract: This paper presents an example of extreme involvement of users and other stakeholders in the development and use of a new concept for e-service (e-Me), involving both public and private suppliers as well as students in a learning co-design process. The e-service is in itself stimulating co-design and learning about its own functionality. The results so far show enthusiasm as well as appreciation among involved stakeholders.

1. Introduction

The task of developing IT-based artifacts and artificial system of today is challenging. Many IT-projects fail due to a lack of synchronized expectations between stakeholders (for instance users, management and clients), and developers.

> *There is little doubt that project requirements are the single biggest cause of trouble on the software project front. Study after study has found that where there is a failure, requirements problem are usually found at the heart of the problem [1]*

In response to this, user-driven approaches have been proposed as *the* solution for ensuring user participation and acceptance [2, 3]. The underlying arguments for this approach are that users should be involved as they know best the specific work situation and that user participation increases acceptance. Our experiences confirm this is not an easy task, and it can be questioned whether user involvement is enough. Maybe, all important stakeholders have to be involved, which makes the development even more challenging. Our stance in this paper is that the users cannot have the only say. This is, among other aspects, due to that the user is many times not the only beneficiary of the support that IT-based artifacts gives. In this paper, we therefore want to explore an integrated process of development, use and learning characterized by the meeting of several stakeholders.

In an innovative research project, we have applied an approach that not only involves users, but also other important stakeholders related to the project, which also opens up for a learning experience possible to use as pedagogical approach for educational purposes. In this project, we are developing an electronic assistant called e-Me, acting both as an agent and as a filter in the information galaxy [4]. The project, which formally begun in 2005, has applied a co-design [5] approach starting from a vision about an electronic assistant as a solution to student self-administration. An important part of the vision was also that the e-Me should evolve over time with input from different stakeholders. To ensure both open and reflective participants we chose a student setting at University College of Borås. The e-Me project is in part a governmentally funded Swedish research consortium consisting of representatives from Umeå University, the University college of Borås, the city of

Stockholm as well as several partner companies like Intel, Microsoft, VISA, Telia, Mecenat, and smaller student oriented companies.

Based on the vision of an e-Me, we and students in Sweden and Spain co-designed ten different scenarios [6]. These scenarios covered eight situations the students want to improve, such as *apply to university and begin studies, Monday morning, You´ve got lots of mail, change of plans, form-filling and reviewing, the elective course, finding jobs, the purse chase,* and *co-buyer groups.* During, the spring and summer of 2006 these scenarios were verified by sending a questionnaire to 16 000 students in Sweden which resulted in more than 3 200 responses [7]. The scenarios were also used to involve the above mentioned stakeholder organizations in a conversation about their roles in a world with existing e-Me's. After this verification a pilot version of the e-Me concept was designed and built. After three months the first prototype of e-Me was deployed for a group of approx. 120 students (January 2007). These 120 students became a part of the e-Me project group and co-designers. The students co-designed e-Me by trying out the prototype – both in order to identify shortcomings in the application and identify new situations, both within and beyond the school setting, when an e-Me would be of assistance. To make this possible a particular (virtual) community space was created as part of e-Me. In this space interaction between different stakeholders, such as the project management, researchers, designers, service providers, the programming team, and the students as users could take place. The goal was to create an on-going dialogue between the various stakeholders in order to improve the design and the understanding of the concept of an electronic assistant.

This e-Me project is an example of a new design paradigm suggested for instance by Klaus Krippendorff:

> *For designers, collaborative software has the potential to involve diverse users in a design process, representing them not merely as statistical data points, but in a variety of roles: as experts in a relevant area, as creative partners, as subjects in short, as stakeholders who can shape the direction a development is taking by asserting their "stake" in its outcome. The lone ingenious designer, who could do everything by him- or herself is rapidly becoming history. [8]*

During the test period of 3.5 months, the project implemented several refinements. Students have been trying out different versions of the e-Me as well as new service providers have been involved. To stimulate continuous interest among the students for being part of the project we used several different mechanisms, such as meetings, workshops, and role-plays.

2. Objectives

The goal of this paper is to report upon experiences from involving several stakeholders in the integrated process as described in the introduction. We will especially focus on the following stakeholders: project management, service providers and the students. We will also describe the role of the community space as part of e-Me. We delimit ourselves to focus on experiences from the prototyping period as such.

3. Methodology – Co-Design Approach for Knowledge Creation

A core idea in the co-design, which is both a scientific approach as well as a development approach, is that there is a close relation between innovative product/service development and knowledge creation [9]. Businesses and organizations constantly try to capture knowledge about ideal situations for customers or clients, which they match with knowledge about resources they have or can create. Successful businesses/organizations are able to constantly developing their knowledge about customer ideals and their own matching resources. Customers or clients on the other hand constantly try to imagine and find out knowledge about their own ideal situations and look for affordable resources,

which can make it possible for them to come closer to ideal situations. In this view, researchers collaborate with business and organizations as well as customers in discovering the lacking knowledge. The dynamic interplay between these actors and processes constitutes the core of the co-design knowledge creation process [10]. All the way trough this process there is also a constantly ongoing inspiration communication flow. The involved actors try to get inspiration from the knowledge creation in other relevant projects as well as they try to get others inspired by their work.

This project shows how researchers in collaboration with different stakeholders have created a new type of arena, e-Me where the customers in this case the students can develop their ideals into a profile, which govern e-Me as a bodyguard and butler on Internet. From the service providing companies perspective e-Me can serve as input for new service development activities, as well as it gives a relevant and high precision channel for marketing and service delivery.

4. The Present Stage of the e-Me Prototype

So far the dominating concept of online service has been "the site", i.e. a place or a homepage on the internet that users surf into and use. Today there are uncountable numbers of such sites with one or more servers. This phenomenon is the target and the point of departure for the e-Me Project. This research project has found that the huge numbers of online e-services is becoming a problem for many citizens. At the same time, there are many demands for new e-services. This phenomenon is referred to as the Electronic Service Paradox. [6]. This paradox is the force behind a number of developments that deviates from the "site model". Close related to this paradox is the multi-channel challenge facing both companies and individuals. From the individual point of view you as a person have at your disposal email systems, mobile phones, electronic calendars, search engines, etc., it's still *you* who has to integrate all of these and merge them into a coherent whole.

Creating an electronic assistant, an e-Me, that took over some/many of these tasks might help solve that problem. Technically e-Me can be conceptualized as an IT-artifact for integrating different information services. e-Me is an entity that "lives in the cloud" (the electronic media space; the internet, mobile phone networks etc). e-Me is running on servers that are connected to internet and mobile phone networks 24/7 and acting on behalf of its user. In the pilot version the main access to the e-Me is through a web site, while the e-Me is also using text messaging by using the mobile phone to communicate with its user. The different critical functionalities of e-Me has been divided into several areas such as the individuals interaction with the e-Me, the core functionalities of e-Me as such, e-Me interaction with other e-Me's, e-Me interaction with the information society, and e-Me interaction with single service providers as well as with match-making organizations.

The core of the e-Me consists of the following components:
- *Calendar management*, in which the user's calendar could be shared with other e-Me users' calendars. Different categories of bookings could be highlighted by using different colors.
- *Mood management*, in which it possible to set and manage in which mood the e-Me user is. Three possible moods have been implemented in the prototype; private, meeting and open.
- *Mail aggregation*, in which mail could be popped from different sources and distributed dependent on the mood that is set.
- *Contact Management*, in which contacts can be grouped into different categories and a status of the contact, could be set in relation to the possible moods.
- *Archives*, in which files (of different types) could be stored and shared with other e-Me users.

- *Community,* where the stakeholders; users, developers, e-Me project management and service providers can discuss the e-Me, suggest improvements/additional services and share experiences.

In the left part of figure 2 different "blobs" (views) of the e-Me is depicted. In the right part of the same figure one of the blobs is expanded.

Figure 1: The e-Me with all its "blobs" and an example of one of the blobs of e-Me

As seen in Figure 1 there is also a blob called assignment. This blob is where the user manages all tasks that are assigned to the e-Me. So far we implemented the possibility for e-Me to receive study results (from Ladok – a national system for reporting study results), get the schedule into the calendar (from NeverLost – the school's scheduling system), receive this weeks lunch menu, as well as matching desires and needs of offers from organizations with students discounts (from Mecenat).

e-Me also supports device independency in the sense that e-Me gives a possibility for the user to interact with his/her e-Me via a web-browser or his/her mobile phone. This aspect of mobility also means that the e-Me could notify the user concerning different events (such as emails from contacts with the right mood, changes in schedule, matched offers, changes in the study results etc.).

A lot of energy has been put on the graphical interface. The project has been striving to avoid developing the e-Me towards what looks like interfaces that exists today. e-Me is not an agent, not a firewall, not a search engine. e-Me is an e-Me. The main guiding principle for interface design has been to hide all, or as much of the complexity behind integrated service approaches.

5. The Pilot Site

The described prototype has been incrementally developed and validated in a collaborative, multi-contextual, empirical real-world environment (c.f. e.g. [11]). Approximately 200 different "stakeholders" (University College of Borås (UCB) staff, researchers, developers, e-Me project management, service providers, the programming team, and students) have been part in developing and validating this prototype as part of the students supporting environment at the (UCB) so far.

There were several purposes with running the pilot at UCB; to create a showcase, to make a proof of concept, to perform use case studies, and to make business case definitions. There were many stakeholders involved in the pilot situation. First, we had the students who had signed up for participating as co-designers. To manage these students we created an organization consisting of a student coordinator and eight student ambassadors. Some of the partners took a stronger identity in this pilot, which meant that these partners contributed both by supplying with resources and by their presence. Media also played an important role – both for fulfilling the needs of being a showcase – but also for letting different stakeholders understand the value of the efforts performed in the project. Another important stakeholder in the project was the newly established InnovationLab, an on-campus software research lab. The role of InnovationLab was to develop and maintain the e-Me, but primarily to improve the artifact based on the feedback from the students and other parties. In order to manage this, a particular IT-based community in e-Me was used. The goal was to create an on-going dialog between the various stakeholders in order to improve the design and the understanding of the concept of an electronic assistant. At the same time it was possible to follow the emergence of the e-Me prototype.

Meanwhile, the development, use, and the test period, a formal and formative evaluation plan was also set up. This included:

- an on-line survey (based on a modified version of UTAUT [12])
- contribution in the on-line community by users and developers
- documents from weekly project group meetings
- close interaction with the student champions and ambassadors
- e-Me user narratives (the students where asked to write a postcard to a friend explaining the benefits and consequences of an electronic assistant such as e-Me)

Individual and group interviews with the developers where also done in order to understand the role of scenarios and storyboards in requirements specification and to investigate the reasons for why bugs are created in software. Different e-Me transactions performed by the e-Me users has been logged. There have also been interviews with other stakeholders performed in order to get their viewpoints on the development of e-Me. The evaluation is still on going.

6. Results – Experiences from Integrated Development, Use and Evaluation

During this integrated development, use and evaluation of e-Me we can conclude that there has been a lot of interaction between different stakeholders. Probably the most important feature of this whole setting is that the community space is a part of the e-Me system. This created the possibility of having users communicating reflections, changed requirements and identification of new usage situations. These comments created a starting point for other stakeholders to become involved in the dialogue. This co-design setting meant that several kinds of stakeholders had their say about the comments made by the users. In the pilot study, stakeholders such as InnovationLab (the developers), some service providers, associated researchers, designers, and the project management were part of the community. This meant that before efforts of a new version of the e-Me system were decided to be invested in several stakeholders had their say. From the pilot study, there are several examples of users that desire certain functionality, but the project management and the developers claim that the cost in relation to the value generated was too high.

The Pilot study has a rich output of experiences and results; here we will list a few of the more important ones. These experiences and results express desires from different stakeholders as well as the use of different instruments (such as e.g. the e-Me community) for driving the integrated development, use and learning process forward. The pilot test

reports that the e-Me concept is working well and a core group of partners are planning to turn the e-Me into reality. Some important experiences and results are:

- The students want the e-Me to continue to grow and develop. As indicated from the student workshops with scenarios students felt that e-Me was a step in the right direction of what they needed and they want the prototype to evolve further. The UCB management also has recognized the value of e-Me and a developed test period for new groups of students are financed.
- This setting delivered experiences that e-Me is worthwhile developing to a full-scale-situation (proof-of-concept). Interestingly, the students developed experiences that integration was to prioritize before extreme high functionality of each component (even if the functionality of each component needs to be good enough). Further, it should also be noted that the students appreciated the important uniqueness in e-Me was its ability to reflect the e-Me user's personality (such as e.g. the user's mood) to a high extent.
- The e-Me community as a powerful learning arena for use and development of IT-artifacts. The e-Me community was important for the development team at Innovation Lab as well as for the students as end users of e-Me. It was also important for the research team to follow the arguments and ideas that was created in the community. Finally the comments from the student ambassadors that they learned a lot about IT-development on by participating in the e-Me community indicates that a community of this type can be used as a pedagogical tool for education of students in IT-related subjects.
- The importance of the first materialization of a new concept. We got a lot of feedback from the scenarios as such, and the materialization of e-Me greatly widened the interested audience and new insights of new usage situations of e-Me came forward. In this process, the media was important.
- The importance of a group of e-Me ambassadors as introducers and coaching activities. As we have seen in a number of other projects with new technologies, it is important to use a coaching approach. In this project, we did use student ambassadors and they really were the heart of the pilot setting. As one of them said "I learned as much on this project as all other studies together". The pilot would not have been possible without the student ambassadors.
- The student situation as one of many application areas for e-Me. Almost in every discussion with new stakeholder groups a new idea about application areas for e-Me arrived. e-Me for homecare, e-me for immigrants, e-Me for tourists, e-Me for entrepreneurs, and e-Me for knowledge workers are examples of such ideas.
- The usefulness of having the development team, InnovationLab, involved as one co-designing party in the process. Students expressed how good it was that their needs were listened to and how fast some of the ideas to changes could be implemented.

In order to get this environment working we found it crucial that the students got the feeling that the e-Me became their concern. To foster such feeling a number of crescendos, such as new releases, were used in order to ensure continuous attention towards e-Me. These releases were results of student-initiated discussions held among a number of different stakeholders. The students were also stimulated in distributing usage situations to each other that they had experienced when the e-Me would be of benefit to use as well as identifying new usage situations that could be of use.

7. Business Models and Benefits

As described in the introduction this project has had several phases of different design and development activities. This last period of the pilot has been focusing the business models

of e-Me. We have to come back on this issue here is only our thinking about this so far. The main strategy for the moment is to apply an open source and open service idea with no or very small licensing costs. In the centre there must be an entity that protect openness and standard interfaces and protocols between e-me kernel and connected services.

In each application, area then there has to be developed business models. For example, in the UCB pilot the payment for further development comes from the University College and some of the more important service providers. In other areas, the model can be different. Maybe the most important learning experience is that there is not one business model but there has to be a person or a group of persons that constantly design and redesign a working business model.

For the moment, there are also many initiatives starting up to test and develop e-Me in new settings and environments. Examples of such environments are e-Me for health management, and e-Me for workers in SMEs. Do however note that one person, potentially being present in different contexts, has only one e-Me.

The development of business models is driven by the same Co-Design approach, where all stakeholders are engaged in discussions on possible models and their consequences. The experiences from the pilot are very valuable in this work. Again there is strong connection between use, development and learning in this mutual, reciprocal process.

8. Conclusions and Final Remarks

This way of running a development of new innovative IT-solutions is unique. The involvement of the user in systems development is important, but the user cannot be the only party ruling what the outcome of the process should be. Other related stakeholders need to be involved in such co-design process also. It should however be noted that users can have a very important role in putting attention towards essential aspects of the artifact to be developed. The idea of involving several stakeholders in the co-design process has been driving the project reported in this paper. This has been a strong value basis. During the first phase, the project has been driven from a philosophy of keeping the centre clear – forcing ourselves to avoid old metaphors like e-Me as an agent. The prototype and the pilot case have given us strength to put forward e-Me as an e-Me.

Another important experience derived from this project is the role that the media can have in inspiring different stakeholders to keep up the ambitions concerning the level of quality. At the time of the launch of the e-Me for students the project had impact in national TV, radio and newspapers. This drove service providers to understand the importance of supplying with wanted services, the programmers to understand the importance of delivering software with high quality.

One important lesson learned so far – in terms of how to arrange these kinds of integrated development, use and learning processes are – how to ensure that different parties involved in the process adopt a co-design perspective. Such issue becomes very clear when future users become involved as co-designers. How could we ensure that such users do find themselves as co-designers and not just an evaluator? Another important issue is also how different users can support each other in finding good use situations that would ensure a continuous use of the artifact to be co-designed.

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