Requirements Engineering and Stakeholder Management in the Development of a Consumer Product for a Large Industrial Customer

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***Abstract*— We describe the approach to requirements engineering in a development project with participation of a customer, which is a large industrial company, and our company, a software house with 80 employees. The paper is a problem statement. We present problems and challenges we have encountered – and also briefly mention some of the problem's solutions. The most important remaining problem is management of the project's many stakeholders, a subject we describe and discuss separately and in some detail.**

I. INTRODUCTION

We, the authors of this paper, work for the Danish software company Mjølner Informatics A/S, which develops custom-made software solutions for Danish and international customers. For a large industrial customer, we are currently developing a new consumer product, a home control device.

The project started in early 2010 and we expect delivery in the autumn of 2011. Our project group varies over time, but typically includes 6-8 members. The project budget model is time and material. The original estimate was 3,500 hours, but now it is expected that total time consumption will exceed 10,000 hours. Our customer gives quality much higher priority than low development cost.

More specifically, the goal of the project is to design and implement a new user interface (UI) for the home control. The customer has developed a similar home control in-house a number of years ago, and this is in wide-spread use world-wide. Many users, however, find the current UI too difficult to use, and many features are very rarely used. The purpose of the project is to analyze the users and use situations, design a new graphical UI, and implement the new UI – it will include about 100 screens.

II. MANAGING STAKEHOLDERS AND THEIR CHANGING REQUIREMENTS

Indeed, the project has many stakeholders. We met approximately 20 stakeholders from the customer at the kick-off workshop in early 2010. These included the project manager, product managers, sales and marketing representatives, documentation specialists, and physical design engineers. The large and diverse set of stakeholders often has had conflicting perspectives on requirements and design and during the project, we have experienced that other groups of stakeholders suddenly enter the stage.

Different stakeholders have different perspectives and different ways of relating to the product. Thus, communicating the coming product, gathering the right requirements, and knowing when which stakeholder is most important is a big challenge.

In relation to requirements engineering, we have used two supplementary approaches, which we will refer as the UX approach (UX = User Experience) and the traditional approach (use cases and verifiable requirements). By using a combination of the UX approach and the traditional approach to requirements engineering, we have succeeded in communicating to different stakeholders and documenting the requirements of different levels. However, we do not feel that we have found a sufficiently effective way to manage the project's stakeholders so that the amount and scale of changes could be minimized.

III. STARTING WITH THE UX APPROACH

The *UX approach* was applied from the beginning of the project. This was natural, because this is what our customer bought from us in the sales process. With this approach, we conducted field studies, user tests, focus groups, and other user research activities in two of the main markets of the customer.

All the research information gathered in the user research activities was scrutinized, discussed with the customer and consolidated. Among the most important results from this process was the definition of personas [1] that represent key user profiles, whose wishes should have proper priority in the design of the new UI – the best UI for one persona might not be the best for another. Along with the personas, a list of the main use scenarios for the home control was created in order to focus the wireframes and prototypes that were developed subsequently on the main usage and user needs.

It was easy for many stakeholders to relate to wireframes and prototype presentations; these sparked discussions of what users can do in the interface, and where functionality is or should be placed. Personas proved to be a very good tool in communication with all stakeholders keeping discussions focused on user needs. Wireframes are only examples of use scenarios and do not exhaustively describe all the states of the interface, so we experienced that different stakeholders

had different understandings and expectations. Moreover, we saw that our deliberate ignorance of a large amount of low-prioritized functionality that was not covered by the scenarios was another serious challenge.

IV. ENTERING THE TRADITIONAL APPROACH

As the work progressed, it had become clear that the basic product requirements were neither clear nor stable, or well agreed upon. Some of the requirement stakeholders were uncertain that the UI design could ultimately be developed to cover the full set of scenarios. The project needed another way of laying a foundation for agreement about the entire functionality and ensured requirements stakeholders that no requirements were forgotten. To address these problems, the writing of a traditional requirement specification was begun.

The requirement specification consisted of system requirements and included use cases [2] and verifiable requirements. It used a layered style and categorized requirements on four levels, similar to Lauesen's categorization in goal-level, domain-level, product-level and design-level requirements [3].

After an introduction and learning period, the requirement stakeholders became accustomed to reading the requirement specification and the traditional approaches ensured that the basic system requirements were captured and clear, still leaving the design of the UI open to different solutions. A group of technical stakeholders found this approach very helpful; it addressed many of their concerns.

V. USING THE UX APPROACH AND THE TRADITIONAL APPROACH IN PARALLEL

The UX approach and the traditional approach continued in parallel. It was possible to work with the main user scenarios and give them priority without leaving many stakeholders worried about the entirety of functionality.

The visual style and the interaction design of the home control was subject to minor and major changes, because of different stakeholders' opinions and taste but with the traditional approach, in particular the domain-level use cases, the project captured requirements in a way that remained stable through very different interaction designs. However, the project of course still had the challenge of ultimately ensuring consistency between the abstract requirements and a UI with high usability.

Along with handling the two-wing requirements approach, another challenge appeared: The need for managing the requirement changes that occurred, when different stakeholders acquired and worked with different versions of the specifications. An iterative process of acquiring the specifications - prototype try-outs - changing or discovering new requirements took place, to the benefit of the product. This involved intense communication between various customer stakeholders and us, and the tracking of requirement changes became essential and was dealt with (This might have prove more difficult in lager projects with a lager project team)

VI. THE REMAINING CHALLENGES

We believe that with our two wing approach we have succeeded in creating a foundation for communicating requirements with different stakeholder with different interests and agendas, but it remains a problem to identify stakeholders and make sure that they have been heard and are in sync with other stakeholder in the customer organization.

We have experienced that groups of stakeholders suddenly enter the stage, and we have not been able to get the full overview. Examples are various middle managers and brand people. In general, the involvement of different stakeholders have changed and expanded the project a number of times. E.g. at a certain point in time, we learned that the sales and marketing representatives felt that their wishes did not get sufficient attention since the home control appeared too technical and not sufficiently attractive to the market. This was in contradiction with demands for a large number of technical features that came from the product managers.

Even the customer's top management has been directly involved in the project. Obviously top management is a key stakeholder, who can make decisions that can change the foundation of the project. In this project, the top management's perspectives have not always been aligned with the project management's, and it has been difficult for us to decide whose wishes to give highest priority.

The management of the stakeholders is in general very challenging and by looking deeper behind the scenes, we have found two major pitfalls in our stakeholder management – both of an organizational nature and, we believe, to a large extent outside our control. The first pitfall is that requirements and funding come from different places within the customer organization. As we see it, sometimes requirements stakeholders can demand what they feel necessary without considering the implied extra development financing. The second pitfall is that our role in relation to our industrial customer is being a sub-contractor. We do not have the project management responsibility, but can merely make recommendations. Thus, we do not have the authority to make final decisions about requirements and design, when different stakeholders change their minds.

REFERENCES

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