Improving RE Decision-Making via Business-Driven Long-Term View of Software Product's Future Development Steps

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Abstract

Requirements documents are not enough in managing the development of software products for wide markets. Development projects have become shorter and involve many stakeholders within and outside the company. Software companies are missing the explicit links between business decisions and lower-level decision-making concerning a product's future development steps. This work aims to develop practices in forming a high-level and long-term view of software products' future development steps by combining knowledge from different stakeholder groups within the company. The ultimate goal of our work is to find if this kind of view can be used as a basis of value-based decision-making in requirements engineering.

1. Current Interests

The authors of this position paper are researchers at the Software Business and Engineering Institute, Helsinki University of Technology. Currently, both of them are involved in the CORE[1] –research project. The goal of the CORE project is to develop systematic practices for Finnish software development organisations so that they can cost-efficiently involve stakeholders to develop products that satisfy customer and user needs.

In order to be successful in business, product development decisions should be linked to business decisions of the company [9]. It is recognized that R&D activities and the management of R&D must be fully integrated with other activities and management processes of new product development [8]. However, according to our experience, links between business decisions and product development decisions are not explicit in practice and different stakeholders in the

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[1]**Co**mpetitive Advantage through Stakeholder-Driven **R**equirements **E**ngineering

software companies work rather isolated from each other.

Our current interest is in the link between strategic planning and product development decisions in software companies. We want to find out, what are the ways to link strategic planning and operational decision-making concerning the software product's future (especially in requirements engineering phase) in practice.

2. Past Work

We have moved into the field of software business and economics via our past work with requirements engineering issues as well as with process development and innovation management. Especially, our work with in-practice challenging requirements prioritisation [4] has led us to consider the link between business decisions and lower-level decision-making in the context of software product development.

Our recent findings show that one of the practical challenges in requirements prioritisation is that product managers do not know which factors, affecting the priorities, they should base their decisions on. In addition, it is very difficult to explicitly decide on the extent to which the various factors should be taken into account.

According to our research, it seems that requirements prioritisation is challenging without a high-level view of the planned future of the product. Product managers are missing a product strategy that could guide the operational decision-making in product development, especially in the requirements engineering context.

In addition, research on process innovation emphasizes that the strategy of organization and lower-level process vision should be tied together. If knowledge on the strategic context is lacking, only incremental improvements can often be incorporated.

The successful decision-making and implementation of innovations requires clearly presented and shared goals, diversity of knowledge, effective communication, and a supportive organizational climate and participation [3].

3. Issue Statement

According to our experiences with industrial partners, the interest of linking a long-term (few years) business view to operative decision-making in the product development context (here, the requirements engineering phase) is growing. Software companies are moving towards software product business from custom-made solutions and therefore face new managerial product development challenges [5]. Wide markets with a large customer base outside the company and more stakeholders within the company are involved in product development and thereby set new demands for product management activities concerning the future development steps of a product. In addition, while product development projects have become shorter, technically oriented requirements documentation for individual projects is not sufficient anymore for the effective management of software product development.

However, strategic planning of the future development steps of the software products seems to usually be more as if the companies were still in the customer business. Examples of the new challenges companies face that are difficult to manage with customer business practices include that

- customer feedback from many customers in different market segments is more difficult to prioritize than before
- technically oriented product management is not used to tie their development decisions to business rationales/objectives
- marketing and sales need more information about a product's future; what features will be implemented and what is their value for customers and users

Type of issue
The issue of linking strategic planning and operative planning of products' future development steps is mostly about processes, while something should be done differently in order to deliver stakeholders more information for the basis of their own decisions concerning the products. This is also a process development issue. It is not an easy task to form a process for people with different competencies and interest areas. There might be technical solutions that could help deliver the relevant information, but our research suggests that the solution will mainly be non-technical in nature.

Context
The context that we discuss includes companies that develop software products for mass markets. Especially, companies that have moved towards larger markets and more customer segments need to improve strategic long-term product planning. The focus in our research is on decision-making activities concerning products' future development steps, so for example organizational arrangements or sales activities are not in the scope of the paper.

Stakeholders
All software product companies have their own organizational structures and configuration. Thus, the titles of the stakeholders involved with the issue are company-specific. However, the main stakeholders can be categorized as
- business unit level management
- product management
- stakeholders having contact with customers (e.g. sales and marketing)
- product development personnel (e.g. project managers and requirements engineers)

The benefits the participants can obtain are twofold. First, stakeholders involved in the product strategy process will get information that has not been documented before and that can be used as a basis for decision-making concerning the product. In addition, we assume that better understanding about the planned direction for the product's future would prevent making wrong decisions during product development, which will improve the product and add the value provided for customers.

However, our ultimate goal is to improve strategic product management in order to help decision-making in the requirements engineering phase. The main stakeholders that would benefit from the results are the ones that perform product management activities.

Information needs
In order to improve the link between strategic planning and operational decision-making concerning products' future development steps, we first need to gain a better understanding of the current state of product management activities in software product companies. We have to understand what information stakeholders involved in product development currently get from each other and from the environment. In addition, we must find out what information stakeholders would

need more as a basis of their decisions concerning the future development steps of products.

4. Proposed Approach

Based on our earlier research, we assume that managing the development of a product for large customer bases requires more explicitly presented strategic decisions regarding the products´ future development steps. Communication between many stakeholders (R&D, sales, marketing, and management) should be regular and coordinated. The stakeholders should have a common understanding of product strategy, the product's future development steps and their rationales.

The main goal in our work is to identify **a rigorous and practical way for linking long-term strategic planning and operational decision-making in the software product development context.** Specifically, our research questions are:

1. What information do stakeholders need from other stakeholders in order to make decisions concerning the software product's future development steps?
   a. What information do product management need from unit level management, product developers, marketing and sales?
   b. What information do other stakeholders need from product managers about the future development steps of the product?
2. What are the appropriate ways to communicate future development steps (and their rationales) of the product to relevant stakeholders within and outside the company?
3. How to generate a commonly defined long-term view of a product's future development steps?

A further research question concerning just product management stakeholders is
4. Does the commonly defined long-term view of product help product management make better requirements engineering decisions?

Assumptions
Our assumptions concerning the issue statement are introduced in the beginning of the chapter "4. Proposed approach."

Process or Solution
As mentioned above, we have no ready off-the-shelf process for tackling our issue. The purpose of our work is to develop an information-flow model with our industrial partners and categorize good practices in developing such a process. However, the process we try to follow in our case companies can be structured as follows

First step: explicating what information do different stakeholders need in order to make decisions concerning the future of the product
Second step: establishing an improvement group that consists of representatives from different stakeholder groups. The purpose of the group is to develop techniques and practices that help different stakeholders to get information they are missing at the moment. The group should consist of representatives from different stakeholder groups.
Third step: commonly defining a high-level and long-term view of the future of a product and the business environment in which it is embedded.
Fourth step: using the view in decision-making concerning the future development steps of the product

Research Methods
This study is conducted as a case study and follows the action research approach. The objective of action research as a research strategy is to reach an interaction between practice and theoretical research [1].

The study started from an analysis of the present state. The qualitative research data in the first part of the research (Research Question 1) includes:
- Semi-structured interviews conducted by two researchers
- Research diary from the interviews and meetings
- Supportive data: Case company's documentation

After the present state analysis, the development ideas (Research Question 2) are created using participatory group work procedure. In addition, interviews and observation will be used to answer Research Questions 2, 3 and 4. Research Question 4 will be conducted by an experiment.

Previous work
Technology management literature offers one important starting point for our research. Roadmapping is described as the use of a time-based (and often graphical) framework to develop, represent and communicate strategic plans, in terms of the co evolution and development of technology, products and markets; and integrating technology developments with business planning as one of its main perspectives [7].

There is also important work done in the software engineering field. For example Wallin et al. [9] have mapped business decision gates and software development milestones and Chillarege [2] has

integrated market evolution concepts with software engineering processes. Moreover, new product development (NPD) research of cross-functional integration and factors that influence multiple stages of new product development [6] provide one important baseline for our research.

However, due to the special nature of software developed in releases, it seems that different stakeholders within the company would need a common view of a product's future development steps that is tied to business-level decisions. Unfortunately, the roadmapping literature does not provide much help with this particular matter. Furthermore, research on new product development typically focuses on organizational factors [6].

5. Results, Status, Prospects, and Needs

We have been working closely with one company for one year now. We started the co-operation work with a needs analysis phase in which the link between business and requirements engineering was found as one of the improvement areas. At the time of the writing, we have interviewed six representatives from the stakeholder groups within the company. The interviews lasted from one to two hours each and were audio-recorded and transcribed. Finally, the researchers analyzed the transcripts.

At the moment, we command a thorough understanding about current information flows and the information gaps between product management and other stakeholders in one company. On the basis of our interviews, we have modeled information areas that should be delivered between different stakeholders. The next research steps include involving at least one additional case company.

As it is recognized that change occurs only if practitioners are willing; our next steps will include process development and implementation in co-operation with case company personnel. We will establish an improvement group consisting of representatives from every stakeholder group and develop a process to extract and share the relevant information. The last phase is to measure the degree to which the commonly defined long-term view of a product advances prioritisation of requirements from wide markets.

6. Open Issues

One important action point for us is to review the management science literature better. We assume that there are practices that are suitable or modifiable for the software field as well.

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8. Biography

Laura Lehtola (M.Sc.) is a researcher and a PhD student in Helsinki University of Technology. She finalized her Master's Thesis on requirements prioritisation in 2003. At the moment, she works in close co-operation with industrial partners investigating how business issues and product development could be linked in practice.

Dr. Minna-Kaarina Forssén (Doctor of Science, Tech.) has many years of experience in the field of innovations and innovation processes. Her recent research has focused on enablers and disablers of the innovation processes, as well as on process and organizational innovations.