Redefinition of the Requirements Engineer Role in Mjølner's Software Development Process

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Abstract. [Context and motivation] Our company's software development process describes seven roles, one of which is the requirements engineer. We want the work of the requirements engineer to give more benefit in our development projects than is currently the case.
[Question/problem] The requirements engineer works in an interdisciplinary setting closely together with the other roles, in particular with the user experience specialist, the software architect, and the project manager. We have found that these three roles are performing most of the actual RE work in our projects. As a consequence, the requirements engineer often only plays a minor role, which is also explained by the fact that the requirements engineer role is not given high organisational attention. With a few exceptions, the requirements engineer is appointed ad hoc, at project level. This poses a potential risk of neglecting important RE activities. The problem that we address is how to best distribute responsibilities between the requirements engineer role and the other roles in our organization.
[Principal ideas/results] We have surveyed a number of recent projects and have analysed to which extent RE has been carried out, by which roles, and with which techniques and tools.
[Contribution] Our contribution is to discuss our survey results and on this basis propose a redefinition of the requirements engineer role that respects that user experience, software architecture, and project management have a higher organisational priority.

Keywords. Software development process, requirements engineering in relation to other roles, relationship between RE theory and RE practice.

1 Introduction

Mjølner Informatics is a Danish software company, which develops custom-made software for customers like Terma, Danfoss, Velux, Big Dutchman, and Bankdata. We are around 80 employees; the majority has a master's degree in either computer science or software engineering. Many of our projects run for 6-12 months and have project teams with 6-10 employees.

Mjølner has a software development process, which is an iterative process that comprises seven roles: Architect, Developer, Infrastructure Manager, Project Manager (PM), Requirements Engineer (RE), Test Manager, and User Experience (UX) Specialist. The roles should ensure a clear distribution of responsibilities during project execution. This very often works well, but improvements can be made as we discuss in this paper.

For each of the seven roles, a "process community" exists in our company. The process communities are the main drivers for the maintenance and improvement of the development process. Most employees are members of one or two communities. Focus in the communities is on sharing knowledge, experience and evaluating current practice to improve the development process and transfer knowledge between projects. To ensure a coordinated effort between the seven communities, the chairmen of the communities comprise a SPI coordination committee. For a more detailed description of our development process and SPI organization, please refer to [1].

Members in the RE process community in Mjølner have investigated how requirements work is done more specifically in practice in our projects. The overall goal of the investigation has been to redefine the requirements engineer role ("RE role") such that it provides a greater value in our projects. In this paper, we discuss this investigation. The paper is a Problem Statement in the sense that it describes a situation that we want to improve – but it also briefly outlines a possible solution.

The paper is structured as follows: In Section 2, we present our RE process, role, and the RE community at Mjølner. Section 3 describes results from the investigation of practice. In Section 4, we discuss considerations about a redefinition of the RE role and in Section 5 we state our proposal. In Section 6 we briefly discuss related work, and draw some conclusions.

2 RE Process, Role, and Community at Mjølner

The following figure outlines the RE process at Mjølner by describing the activities that must be carried out by the RE role, as prescribed by the development process.

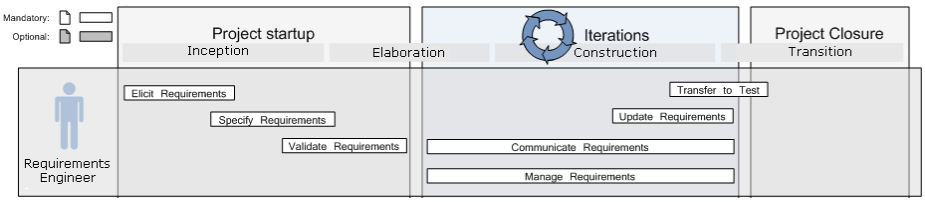

Fig. 1. Description of the RE role

This description is closely connected to the activities that are on the agenda in Mjølner's RE community. However, in this community, the work has mainly focused on how to improve the elicitation, specification and validation of requirements (the

activities in the "Project startup" in the figure), and to a lesser extent on general requirement management and the other activities in the "Iterations" in the figure.

The body of knowledge in Mjølner's RE community is manifested in a toolbox. This toolbox consists of a hands-on guide for doing RE, a software requirement specification template document, which includes many issues to take into account along with guiding descriptions, and an internal website, which contains supplementary material, including references to RE literature. We keep ourselves updated on the RE literature, e.g., by attending conferences such as the RE conference. As examples, we have read and found inspiration in the following books [2], [3], and [4]. Our template is to a large extent based on [2].

3 RE Practice at Mjølner

Members in Mjølner's RE community have interviewed project members from ongoing and past projects to identify how RE was performed and by whom in practice in our company. Different topics were covered during the interviews, e.g., the roles in the project, how requirements were elicited and by whom, the types of requirements, which methods were used, and how requirements were documented. The interviewers also asked if and how the knowledge from the RE Mjølner community came into play in the projects. We report on four projects below. The projects were quite different in many aspects, including RE. In none of those projects, the RE role was explicitly appointed to a team member. The interviews were therefore done with either the PM or the UX specialist.

In the first project, the customer came from the public sector. Requirements were already elicited by the customer and specified in a one thousand pages document. Despite the extensive document it was, according to the PM at Mjølner, a rather incomplete requirement specification and there was estimated only little time during the project to clarify the requirements and reach a satisfying level of detail. Requirements were written in use cases and managed by the PM along with a third party subcontractor. The project team at Mjølner did the design of the GUI as well, so some of the details of the requirements were brought to development by the UX specialist through screen mock-ups.

In the second project, Mjølner took over the project from another supplier and, consequently, inherited a way of cooperating with the customer. No requirement specification existed. Instead, requirements were inferred from screens of the system, which came from a third party. Rework became one of the challenges in this project. All the unknowns were dealt with at weekly meetings with customer stakeholders.

In the third project, the involvement of the team at Mjølner was initially to do the graphical layout of an already specified system. But as the UX specialist started asking questions about the system and the underlying requirements, the customer became convinced to do a complete redesign and let a team at Mjølner do the job. RE was done entirely by a UX specialist, who used methods and processes from a UX toolbox (different from the RE toolbox); in this case being flowcharts/sitemaps,

wireframe mockups and scenarios. There is inherently a difference between UX and RE in process and approach to requirements – epitomised in the role of design [5].

In the fourth project, requirements were gathered as use cases by an internal product owner in a Word document and elicited through meetings with a few customer stakeholders – mainly a single representative. The document was revised, versioned and read together with a representative from the customer organization. The main challenge here was to ensure sufficient activity from other important customer stakeholders. Again, the RE role was not explicitly appointed to a team member, but was distributed between the product owner and the UX specialist.

4 Basis for Redefinition of the RE Role at Mjølner

In summary, the survey confirmed our conjecture that the RE role, if assigned in a project, only makes a minor contribution to the requirements management that is carried out in the project; the majority of the RE work is done by other roles. Moreover, none of the surveyed projects had benefitted much from artifacts from the RE body of knowledge in Mjølner. This fact confirmed that there is a gap between the issues on the agenda in Mjøner's RE community, and the RE work that is carried out in practice in the projects at Mjølner.

The conclusion from our survey has motivated us to take a closer look at how the RE role positions itself against the other roles in the projects at Mjølner.

To do this, and as a help to redefine the RE role, we (the authors) have created the grid shown in the figure below, which illustrates the RE activities (the horizontal bars), the education or skills of the project team participants at Mjølner (vertical bars), and the ellipses show the various roles in a project. It is a rough indication based on the assignments in several projects at Mjølner, in particular the projects we discussed in Section 3. Each ellipse illustrates a role and its horizontal extent shows the typical educational backgrounds of persons assigned to this role. The skills range from hardware-near computer engineer/technician skills to creative graphical design skills. The vertical extent of the ellipse shows various requirement activities to be done by the role - from highly technical requirement handling over interaction designs to more abstract business goals elicitation.

We plotted the roles in this grid as ellipses to see where the roles overlap each other. The picture was quite clear. The RE role is "squeezed" both in education/skills and RE activities in the projects at Mjølner, since a major part of the responsibility of the RE role is handled by the other roles, mainly the project manager, the architect, and the UX specialist.

There are a number of reasons for this. First of all, UX as a product is a selling point for Mjølner (RE is not). In a number of our projects, one or more UX specialists are allocated – catalyzed by our sales department and by agreement with the customer – as starting point.

Second, all the UX specialists that are assigned to the UX role are focused on and skilled in doing requirements elicitation because this is, obviously, necessary to ensure that the system being developed actually satisfies the needs of the users. The

UX role does studies of users, field studies, and focus groups, often resulting in personas and scenarios, as well as workshops with stakeholders to elicit and specify requirements at different levels.

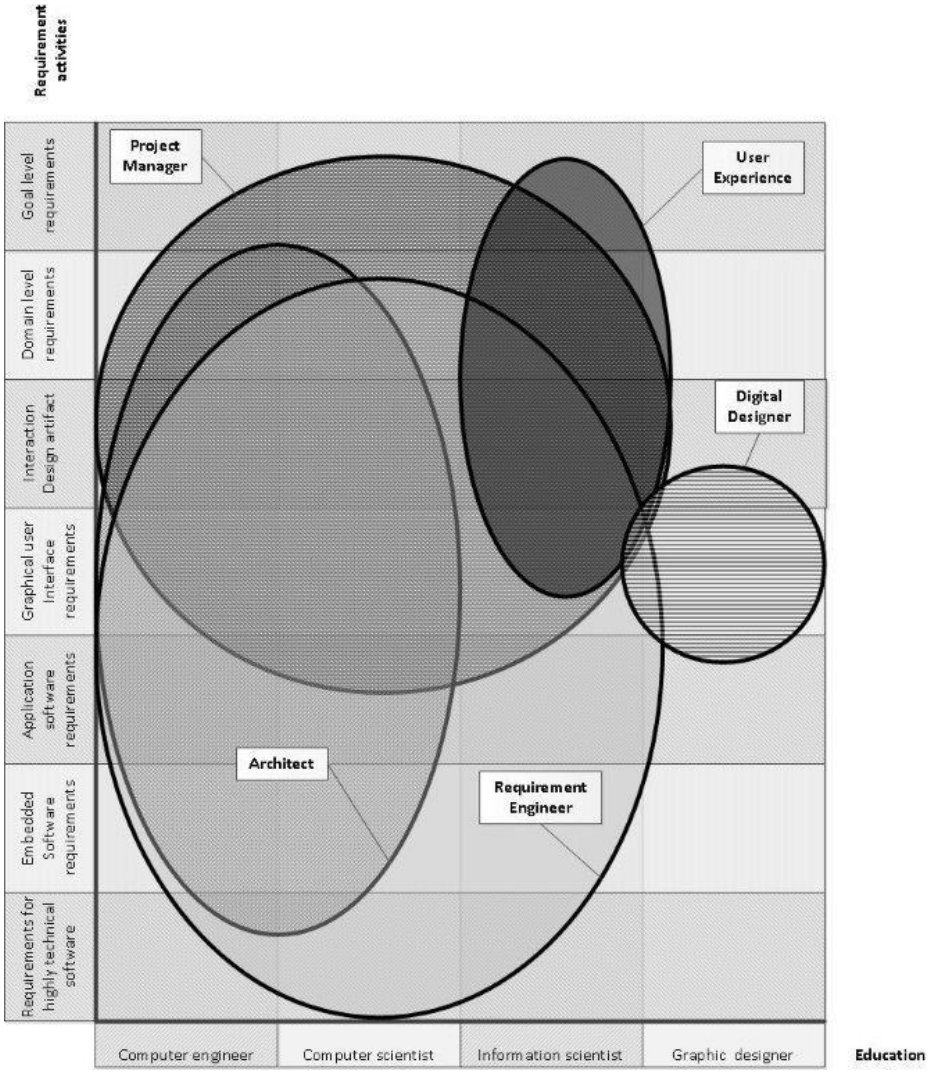

Fig. 2. Requirement activities, roles, and education

Third, in the initial phases of a project, the requirements specification document is often drafted and maintained by the project manager. When the implementation starts, this specification itself tends to become less relevant internally in the project; a Scrum-style backlog, along with references to deliveries from the architect and the UX specialist, serve the role as the requirements specification. In general, when the

system is being implemented, often the software architect drives the RE process, because much requirements work assumes a detailed knowledge of the architectural details.

5 A Redefinition of the RE Role at Mjølner

The conclusion after the investigation was that we had the problem to redefine the RE role. Clearly, the RE role should focus more on activities that are "left" by the other roles with higher organisational priority. With a more specific focus, the RE role must make sure that the gaps that might appear between the architect, the UX specialist, and the project manager, in regard to requirements, are filled. Examples of areas that need the specific attention of the RE role, we believe, are data requirements, security requirements, quality requirements, and pure management, e.g. keeping track of requirements changes throughout a project.

Regarding data requirements, we specifically aim at two activities, which are often crucial for project success that should be given more attention by the RE role and the RE community at Mjølner; these activities are (1) development of dictionary or glossaries defining key domain terms, and (2) development of domain models, e.g. using ERD or ORM diagrams. This will help to visualise and document concepts of the domain in a way that our typical UX specialist and architect deliveries do not.

With respect to security requirements, for some of the systems we develop, it is critical that these are gathered, discussed and understood. This is a type of requirements that the RE role should be responsible for.

Quality requirements such as performance, reliability, and maintainability are important for the architect, but needs to be documented as requirements without getting into solution design - which is a risk if the architect has primary responsibility of these issues.

The last part that we wish to strengthen as an RE activity is the book-keeping of managing the requirements in our processes. Making sure that changes that arise during the project are specified in the right documents, and making sure that the "why" and "when" for the changes are also documented. This might just be in a meeting minutes, which the team roles can then discuss after workshops, or other encounters with the customer. A part of managing is also making sure that the proper level of traceability can be done. Discussions of the necessity of RE book-keeping activities are also found in [6].

This last activity of managing requirements is an activity that we expect will only become more important and bigger as projects done by our company grow in size. Our company's mission is to have projects at a larger scale and continuously moving up the value chain of the customers. This will mean a larger amount of requirements, but also a larger interface with the costumer, where customer stakeholder needs different parts of the requirements. Similar communication challenges are described in [7].

6 Related Work and Conclusions

Our findings and considerations presented above are done for our particular company and we do not have empirical evidence to make generalisations on a proper scientific basis. Other authors have done far more extensive investigations of related issues, e.g. [8]. An example of an investigation with similarities to ours is [6]. In both these cases – and many others that we have seen in the literature – the investigations and results are reported by researchers, i.e., by people who are external to the particular organisation being investigated and who, consequently, look at the situation from the outside. In contrast, we work for the company, whose situation we have discussed and described. An advantage of this is that it is likely that we have much more detailed and precise knowledge; a drawback may be that we are more involved and perhaps not able to be as objective as an outsider would be.

In spite of the remarks above, we believe that the issue that we have discussed in this paper is an instance of a very general problem: to position RE well in an interdisciplinary setting, properly coordinated with other roles in a software development process. We know companies, where (1) the RE role is under pressure, (2) where the role does not exist explicitly, or (3) where the role is near extinction – either because the activities, that are carried out by the requirements engineer are handled by other roles, or, worse, because the activities are not handled at all. In the latter case, there is a risk of leaving large gaps between, e.g., UX and architecture.

We have proposed a redefinition of the RE role in the software development process at Mjølner by narrowing its focus to activities not covered by other roles. In Mjølner's RE community we will prioritise these issues.

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