Clear Role and Process Definitions as a Means to Analyze and Understand Conflicts between Project Management and Requirements Engineering

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Abstract

Based on our experience with eight case studies, we found that unclear role and process definitions, especially in Project Management and Requirements Engineering, cause problems in early project phases. We suggest a role model and process model for the interplay of Project Management and Requirements Engineering for analyzing and understanding conflicts. These models can serve as a basis for further research.

1. Introduction

According to the frequently cited studies [3], [12], Requirements Engineering (RE) is important to project success, at least in the Information Technology (IT) area. Project Management (PM) is important to project success by definition. Many project artefacts, especially project management artefacts, need requirements as essential basis (e.g. work packages, budget, contract, project plan, risk analysis). And vice versa, the project manager organizes the prerequisites for all project work, including the RE work. Therefore RE and PM are related closely to each other.

The "RE&PM" Working Group (www.repm.de) of the German Informatics Society's (GI) Special Interest Group "Requirements Engineering" aim was to identify the causes of project problems and conflicts at the interface of Requirements Engineering and Project Management. For doing so, the Working Group, consisting of twelve members, analyzed eight case studies and found various problems related to role definition. We, the authors being the Working Group's core team, derived a graphical presentation of conflicts within software projects and propose clear role and process definitions as a means for analyzing and avoiding such conflicts. We are conscious of the importance of political and socio-organizational factors for the project's success and for the assigning of roles. But in the actual state of our work, we abstract from these influences to get a sharp focus on the different roles.

This paper presents, for further discussion, the current status of the Working Group's ideas.

The remainder of the paper is structured as follows: Section 2 describes our data retrieval: literature research and case studies from industry. In section 3 we interpret our findings and introduce our idea of differentiating between the position and the role of the Requirements Engineer and the Project Manager. Section 4 contains our definitions of the roles PM and RE during the project definition activities. Section 5 evaluates our results and section 6 gives an outline about what we plan as our next steps.

2. Data Retrieval

The Working Group took on its work by trying to understand what commonly is meant by Project Management and Requirements Engineering. After short term discussion the members found themselves stuck: twelve people, twelve definitions, twelve different meanings. The group decided to follow two approaches parallely:

- o Collecting case studies on experiences concerning the interplay of Requirements Engineering and Project Management. Eight case studies have been

collected up to now. This paper presents an abstract of one of them.

- o Performing literature research on role definitions

2.1. Literature Research

The generally accepted definition of requirements engineering is based on a paper of Ross and Schoman from 1977 [11]. They defined requirements engineering as "a careful assessment of the needs that a system is to fulfill. It must say why a system is needed, based on current or foreseen conditions, which may be internal operations or an external market. It must say what system features will serve and satisfy this context. And it must say how the system is to be constructed."

This definition describes tasks, but no roles or positions. It is typical for a great part of the literature on software and systems engineering not to define roles (see as further examples [7] and [10]), although the empirical literature indicates that the definition and the cooperation of roles have a strong impact on the project success (for example [13], [9]). The SWEBOK [5] even questions the existence of a discrete discipline of RE and subsumes it under the discipline of SE.

Still the IEEE Standard 1233 [7] differentiates between the roles of the requirements engineer (=analyst) and the stakeholders (=customers) [6]. Firesmith [4] defines the requirements engineer as being someone who does RE tasks, but here also names sales and quality management activities. Present process models take up requirements engineering as a part of the systems engineering process either with dedicated roles of the RE (i.e. the "V-Modell XT" [14]) or with an integrated RE job (i.e. XP [1],[8]).

2.2. Case Studies

So far, we analyzed eight case studies. The following project problems related to roles have been observed:
- o Several persons took multiple roles and were confronted with role inherent goal conflicts.
- o If several persons work in the same role, the coordination of their work and it´s consistency is difficult.
- o Persons did not work in their respective roles adequately in terms of quality because they were e.g. unexperienced or unqualified.
- o Persons were not able to take their roles properly because e.g. decisions from management left too few resources.

In this paper, for the sake of shortness, we only want to present one of the case studies in detail. This example project consisted of delivering a customized and enhanced version of the latest product version, which, in the moment of sales activities and contract signature, was

not finished yet. The sales activities had been done by the company´s Vice President Development. When the project's Project Manager entered the project, the contract was already signed. The Project Manager estimated a significantly higher effort than the Vice President, but was never approved. The project did not get enough resources, and some risks connected to product development became true, like features having been promised for this project were postponed to a later product version, and the product was developed and tested too late. The Project Manager´s warnings and reports were not taken seriously by the Vice President and other managers. Later-on, when the Vice President also worked as another project's Project Manager and needed resources, he took them from the first project.

3. The Idea of Differentiating Between a Person's Role and the Person's Job Position

Why did all these conflicts occur? Our opinion is that these conflicts arose
- o either because several people did work in same areas of expertise but did not communicate with each other adequately
- o or one person worked in several areas of expertise simultaneously and suffered from internal role conflicts while at the same time not recognizing them or not being able to solve them.

We find that differentiating between a person's role and a person's position serves as a good means to recognise and to explain these conflicts, which we expect to make it easier to solve them.

3.1. Basic Thoughts and Visual Representation

We define "Taking a role X" to mean the same as "working in the X area of expertise" where e.g. Project Management and Requirements Engineering are "areas of expertise".

"Holding a position Y" means "being responsible for Y in an organization" or – in a visual way - "one's name is written into an organization's hierarchy chart rectangle representing to be responsible for Y". This holds as well for projects as for line organisation.

As depicted in Figure 1, in the project, an employee (let's call her Whitney H.) can hold the Project Manager's position. In the B project, a person from higher management might hold the position of the Project Manager. This person from higher management may, at the same time, hold the position of a Vice President

Development (let's call him Mel G.) And let's introduce Tina T. to be "The B project's Requirements Engineer":
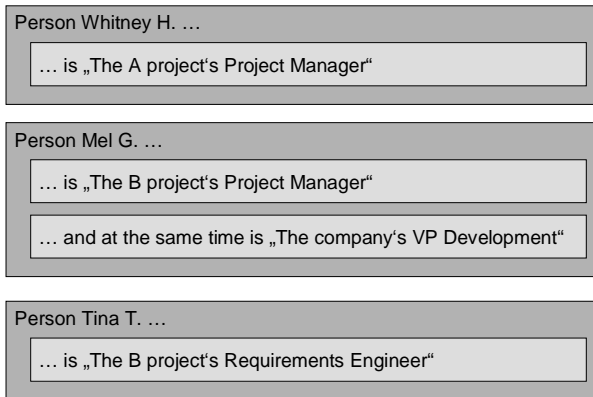

Fig. 1: Relationship between persons and positions

Let's have a first look at PM and RE activities: If Tina T. as "The B project's Requirements Engineer" plans and organizes her project's Requirements Engineering tasks, she does not work in the role "Requirements Engineer" but temporarily takes the role of a "Project Manager" (see Figure 2). Please remark the subtle fact that Mel G. as "The B project's Project Manager" remains unchanged at all times. Before planning and organizing RE activities, Tina T. should have agreed with Mel G. upon doing so since otherwise she possibly starts "poaching" in what Mel G. might see as his own responsibility. First conflicts may arise! And please keep in mind, too, that, when formulating the project's goals, "The B project's Project Manager" will work as a Requirements Engineer since the project's goals may be formulated like requirements to be met by the project: "The B project shall achieve this and that".

How may it occur that "The company's Vice President Development" works as a Requirements Engineer? One of his tasks is to elicit customer needs, another to formulate the company's goals!

Now how about estimating? A Requirements Engineer shall work on Requirements - not on solutions - and therefore needs not to be experienced in the field of possible solutions. Producing good estimates needs experience in the field of possible solutions. If someone, holding a position "Requirements Engineer", does estimating, in our point of view this person keeps her/ his position, but temporarily changes role and works as a "Software Engineer", where "Software Engineer" and "Software Engineering" (SE) name the role and the area of expertise of realising IT solutions, respectively. The same holds true for any Project Manager when estimating project effort. There are exceptions: we think estimating effort for RE activities belongs to the RE area of expertise and should be performed by a Requirements Engineer. Analogously all effort estimations are best made by the person who is supposed to perform the corresponding task.
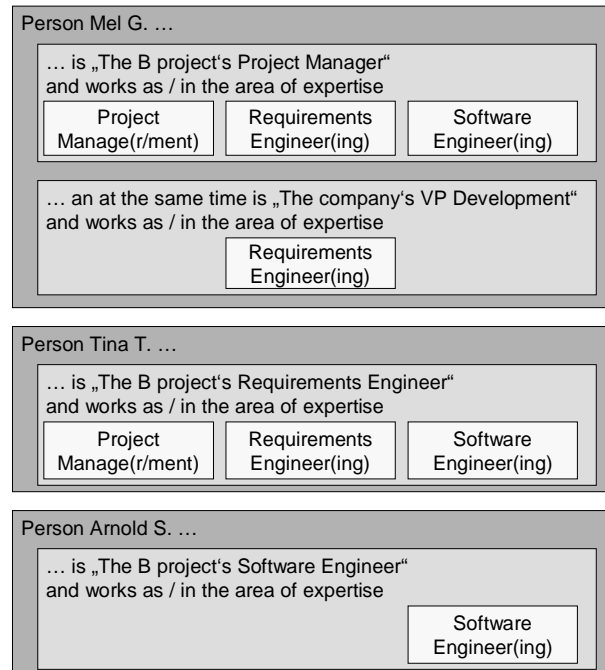

Fig. 2: Relationship between persons, positions and roles

How might Arnold S. think about Tina T.'s and Mel G.'s effort to produce valid effort estimates when it is Arnold's area of expertise to construct IT solutions? How will he react to not even having been consulted?

3.2. How the distinction between positions and roles explains project problems and conflicts

The role definitions of the previous section help to understand project problems and conflicts like those observed in our case studies.

In the example case study described in section 2.2, the (new) project manager Whitney H. works in conflict with another person, the Vice President Development, Mel G., who is two levels above her in hierarchy. He has been doing the sales (see Figure 3).

In our case studies, we found "Sales" to be a crucial part. The difference between job position and role can be discussed on this example. Sales certainly is a job position as people are employed explicitly as sales personnel for doing sales activities. But does a distinct role "Sales" exist or does the person with the job position "Sales" do nothing more than coarse-grained RE and PM before the project starts and before the final occupants of the RE and PM role are assigned to the project? Sales

could be seen as a separate role because this person needs expertise in market knowledge and has the goal "signing of contract". More generally, we define a role *lobbyist* whose only aim is to initiate the project. The role *lobbyist* might be taken by a person in a sales position, but also by persons in different positions, e.g. for in-house projects. A lobbyist is interested in the project to be initiated, but he will not formulate any requirements to be met. The role lobbyist is different from the role of a stakeholder, because a stakeholder will formulate requirements but might not be interested in the project to be initiated. Lobbyists can be found as well on the customer´s side as on the supplier´s side.

According to our definitions, a sales person usually is even working in the role of a Software Engineer when he/she does effort estimation, as Mel G. did. Estimating needs knowledge of the field of possible solutions. This area of expertise is called Software Engineering.
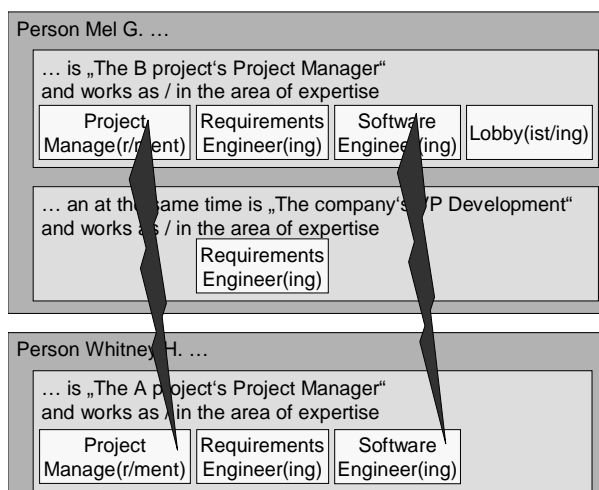

Fig. 3: Conflict between role and position

Our example case study shows another problem: the competition for resources among different projects. As Mel G. is higher in hierarchy, his estimations and decisions are more important than those of Whitney H. He has the power to decide that Whitney H. will not get enough resources, especially when he needs her resources himself, for his own project he is managing. There is a manifold conflict between both persons: two persons working in the same role in the same project coming to different results are in conflict. Two project managers working for different projects also are in conflict when there is shortage of resources. These conflicts were worsened by a conflict in position, especially position in hierarchy.

To recognise, explain and maybe reduce such conflicts, we propose an exact distinction between the roles.

4. Role Definitions and Process Model

For the purpose of describing the relationship between RE and PM, the Working Group suggests to differentiate between the following roles: Additionally to the Project Manager (PM), Requirements Engineer (RE) and Software Engineer (SE) we distinguish Stakeholders (SH), and Lobbyists (LO). We do not differentiate between technical and economical project manager. RE can take place in a project as well as in line function.

By the role Software Engineer we mean all those who are involved in the design, realisation and quality management of the system, except for PM and RE, i.e. designer, programmer, tester, quality manager, administrator and so on. For the purpose of clarifying the relationship between PM and RE, we do not see the need to differentiate this role further.

The Stakeholders are all those who formulate requirements. This includes not only technical, application domain and economical contact persons, or the future users, but also project sponsors, IT department, works council, marketing department and many more.

4.1. The Role of the Requirements Engineer

As mentioned above, we define the Requirements Engineer to be doing activities belonging to the Requirements Engineering area of expertise and describe the role by goals, input and output artefacts, and activities. Goal: successful requirements engineering. Criteria for this goal: quality of RE document (complete, up-to-date, understandable, etc.), requirements reflect stakeholder needs. Input artefacts: requirements. Output artefacts: stakeholder list, requirements document, degree of completion of requirements and associated attributes, information about RE risks and RE problems, choice of RE tool. Activities: generation and maintenance of the output artefacts and the corresponding communication.

4.2. The Role of the Project Manager

Analogously to the Requirements Engineer, we define the Project Manager to be doing Project Management activities. Goal: execute project successfully. Criteria for this goal: on time, in budget, in scope, in quality. Input artefacts: stakeholder list, requirements, effort estimations, risk analyses. Output artefacts: all kinds of plans, for example budget, project plan, milestones, resources, work packages (their definition and tasks, allowed effort and responsible person), controlling and risk reports, decisions, tools, process model, training plan. Activities: generation and maintenance of the output artefacts and the corresponding communication.

4.3. Activity Charts

The activity charts in Figure 4 and 5 describe, for the project definition phase, which activities belong to which area of expertise, i.e. will be performed by which role.

5. Evaluation

Starting from eight case studies, we found out that in practical work, unclear role and process definitions especially in RE and PM often occur and cause project problems. Existing literature seems not to contribute much to clarification. Our first contribution for clarifying the situation is to start to define roles clearly.

We define a role to perform tasks belonging to a certain area of expertise. And we provide activity charts for a first example. Our role definitions for RE and PM and the activity charts are intended to be general enough to be valid as well for external IT projects as for in-house development, product development and even non-IT projects.

We started to clarify the relationship between both areas of expertise, proposed a means for recognising and explaining conflicts and problems between both and are looking forward to further discussions on whether it helps to increase the efficiency of the interplay between PM and RE.

We are aware that clear role definitions do not avoid all conflicts, as there can be strategical, political or organizational reasons for one person working on several fields of expertise or several persons on the same role. In any case, the co-operation of different project team members is essential for project success, because their different expertise and viewpoints are needed [2].

6. Further work

In the next step, we want to work on a more comprehensive presentation (and publication) of all our case studies and their interpretations, of which we here only discussed the aspect we thought to be most important. We will also examine causes of these role conflicts. We also plan to work on a proposal about how the different roles and positions can work together in a way to cope best with the inherent conflicts discussed in this paper.

Those who are interested in the topic are invited to share their experience with the "RE&PM" Working
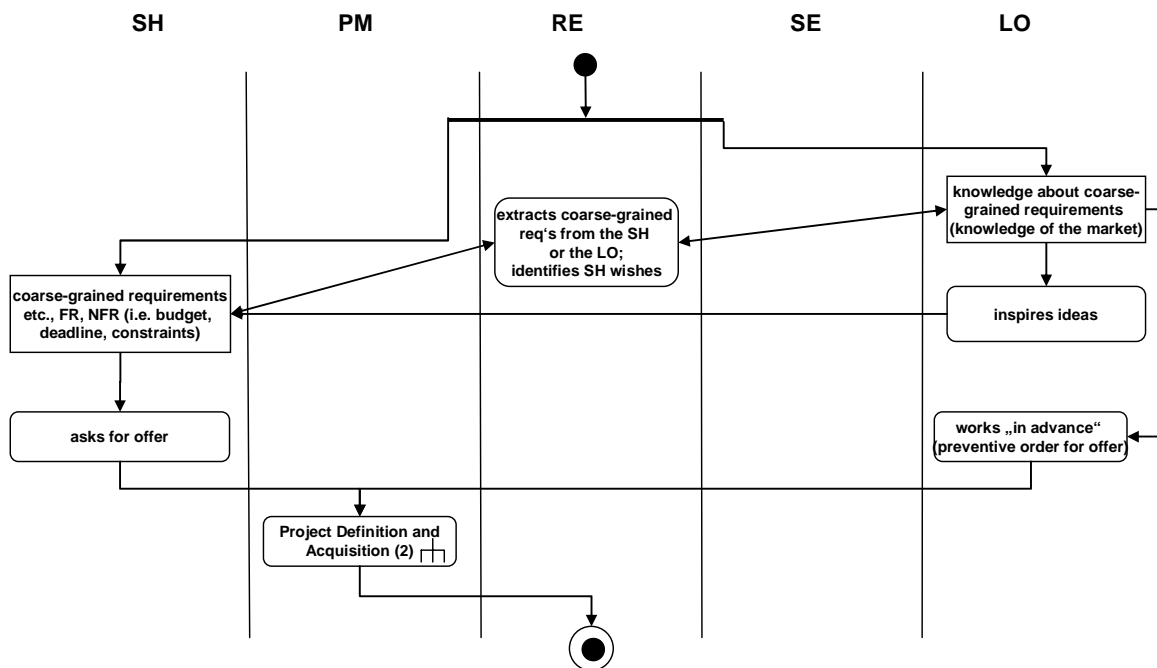
Abbreviations: SH = Stakeholder, PM = Project Manager, RE = Requirements Engineer, SE = Software Engineer, LO = Lobbyist

Fig. 4: Roles and activities necessary for creating and deciding a project offer, part 1

Group (www.repm.de) of the German Informatics Society (GI).

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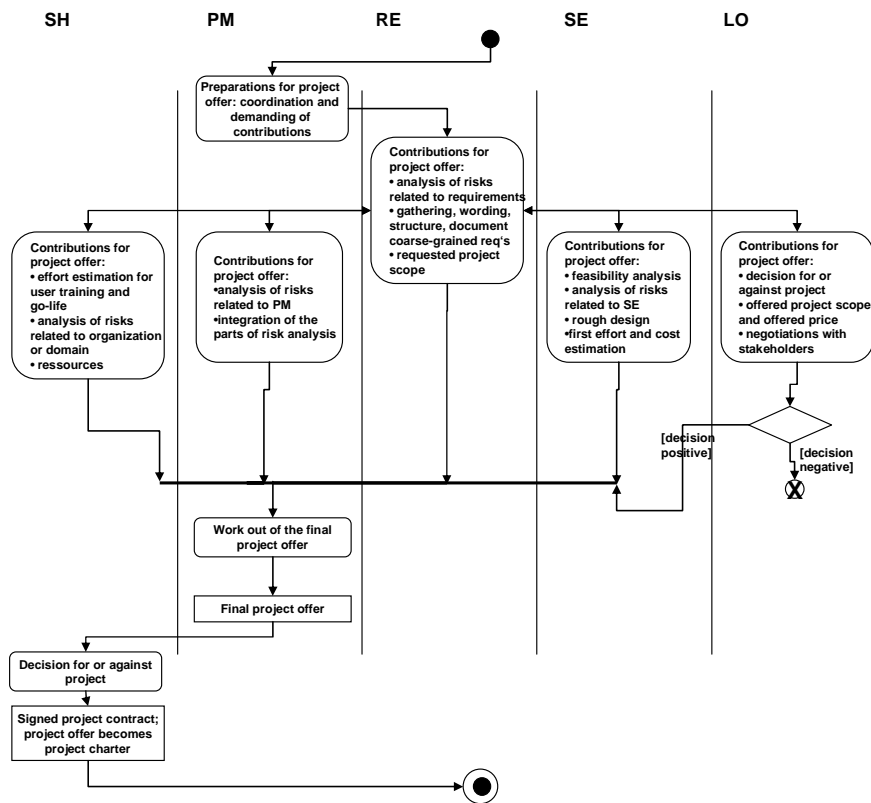
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Fig. 5: Roles and activities necessary for creating and deciding a project offer, part 2