Process Modeling-based Assessment of Software Release Planning

Case Study Results and Experiences

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Abstract- **In the software industry, customer input often takes the form of improvement requests. Release planning is the process of making decisions about what new functionalities or changes will be implemented in which release of a software product. The purpose of this work in progress paper is to explore a new approach to assess and improve the release planning process in industrial software companies. The new approach consists of a combined application of software process modeling, assessment and improvement. This paper presents results and experiences from a case study in two industrial companies.**

Keywords-release planning; assessment; process modeling.

I. INTRODUCTION

An increasing part of the software produced is aimed at being offered to a general marketplace rather than to one specific customer. This type of software development is called market-driven software product development (MDSPD) [9]. In the software industry, customer input often takes the form of improvement requests. Improvement requests and other system complaints often result in an abundance of requirements [2]. Yet, often too little resources are available to implement all requirements at the same time. Proper release planning is as complex as it is important for the success of a software product [10] .

The purpose of this paper is to explore a new approach to assess and improve the release planning process in industrial software companies. This approach consists of a combined application of business process modelling, [5] , and process assessment [11]. Instead of a generic CMMI model for process assessment and improvement a more focused maturity model is used, i.e., the SPM Maturity Model. This maturity model is dedicated to software product management and addresses particular software processes such as the release planning process. In Section 2, we will first address the background of the release planning process, and the motivation for the new approach. Section 3 will present the case study and selected results and experiences of the new approach. Section 4 finalizes the paper with conclusions and further work to be done.

II. BACKGROUND RELEASE PLANNING AND PRIORITISATION

Release planning aims at selecting an optimal subset of features that satisfy as many stakeholders as possible within the budget, resource and risk constraints [10]. Many different aspects can be taken into account when prioritizing requirements. However, involving multiple aspects complicates the decision process.

Regarding the assessment and improvement of software processes, the Capability Maturity Model Integration (CMMI) is a well-known approach [7]. Applications of CMMI in Small and Medium Sized Enterprises (SMEs) have shown several problems, such as: the implementation is too complex, too time-consuming, too costly etc., see e.g., [8]. In our case study we therefore have selected a more focused assessment approach that has as scope software product management. Four main processes, are being distinguished, respectively requirements management, release planning, product planning and portfolio management. For the release planning process a number of focus areas have been defined, see Table I. Capabilities of each of the focus areas are represented by A to F in the rows. To progress through maturity levels 1 to 10, the capabilities of each focus area indicated in each respective column must be achieved. E.g., to reach maturity level 2 the capability A of Launch preparation should be achieved. Moving from left to right through the matrix matures the SPM processes. Progressing from maturity level 1 to 10, the focus areas are revisited multiple times maturing them incrementally as well. An important aspect in an assessment is the collection of information to rate the capabilities. Currently this is done by asking questions to practitioners and by studying project documents. For all the capabilities in the matrix, a company has to answer yes or no to the question 'Is this capability implemented in your organisation?' Advantages of using a questionnaire are that it can be distributed easily to a wide range of respondents across geographic boundaries, it is non-invasive, and it is cost and time efficient. However, there are also serious disadvantages to using questionnaires in software process assessment, respectively: questionnaires have been found to be repetitive and verbose, questions have been found to not be related to the real problem, qualitative information is needed to reflect the software process and finer granularity than yes/no questions is needed to reflect the software process [8]. Regarding our release planning assessment case study, we decided that our assessment method should not only be aimed at collecting answers to yes/no questions, but should aim at an in-depth analysis and discussion of the 'actual' release planning process as it is carried out in practice. Given this aim, and the disadvantages

of questionnaires listed above, we applied a different assessment instrument: i.e., formal process modelling techniques. These modeling techniques have already been recognized for many years as instruments, e.g., [3][4] which both conclude that 'software process modeling facilitates human understanding and supports process improvement'. Also, research on success factors of software process improvement shows that an inhanced understanding of the process by employees, and employee involvement (because of their insight into and knowledge of the process areas), are of utmost importance for the success of a software process improvement project. To select an appropriate modelling technique we first defined the purpose of modelling. Our purpose was to describe the current processes, to determine the current process maturity, and to formulate improvement proposals. This is classified in the process modeling area as 'working towards a descriptive model for learning and process development' [1]. A number of techniques can be used for this type of modelling. In our situation, based on the characteristics from a user and a modeller perspective, formal flowcharts and data flow diagrams have been chosen. Subsequently, we selected Business Process Modelling Notation (BPMN) as our modelling language. BPMN is able to capture aspects of both flowcharts and DFDs (based on the Bunge-Wand-Weber (BWW) representation model), We used the BPMN notation, i.e., its extended modelling elements, as described in [6]. BPMN is already for quite some time recognized as the most ontological complete model [12]. Lastly, it has to be stated that our choice for BPMN was also motivated by current knowledge and expertise in our research group at TU/e,), e.g., [5]. Software process modelling facilitates human understanding and communication and supports process assessment and improvement. Business process modelling is an iterative method that provides rich information on how processes are implemented. Summarizing, our new process assessment approach consists of the application of process modelling techniques to derive information from the actual processes for the rating of the capabilities (in a SPM Maturity Matrix) of a release planning process.

III. RELEASE PLANNING ASSESSMENT AND IMPROVEMENT

A. *The case study content*

The case study addressed in this paper was carried out at two companies (A and B) active in providing telematics solutions to the transportation industry. Companies in this transport and logistics domain are facing major challenges. Competition is large, operating costs are increasing rapidly, customers demand an ever-expanding range of services and the legislation is strict. As more information becomes available digitally, inside the truck as well as outside, data from an expanding number of sources needs to be processed and integrated. This increases the complexity of full service telematics solutions considerably.

Company B is a company that provides telematics solutions to the transportation industry. It has over 280 employees spread throughout Europe. More than 80.000 devices have been installed. It provides products to acquire

mobile operations data and communicate this data between dispatch/shipment control, back-end information systems, and mobile shipping unit (e.g., a truck or trailer, etc.). Company A, a SME, has recently been taken over by company B. Release planning at company A is mainly done by a small group of high-positioned executives, and no formal process descriptions exist. At company B however, processes are more defined and certain formal protocols are in place. The different release planning processes in the distinct companies have to be aligned and should finally smoothly flow together. Preserving the best of both ways of the release planning processes of both companies will contribute to a more efficient process and a higher quality of release planning.

B. *Process modelling and maturity rating*

Process models of the current release planning processes at both companies have been made. In the context of this work in progress paper examples of the process models are not presented here. However, we will clarify in what way we discussed these process models and how we derived information from them to determine the capabilities (maturity) of the release planning processes. The modeling process was identical at both companies. In a first session with the persons responsible for the release planning process a list of persons of interest was put together, not limited to those who are involved directly in the process. Persons involved in requirements gathering and the product development process in general were thus included on the list. After interviews with these persons were completed, the gathered information was used to build a first version of the process models. Subsequently, the process models were used to guide a second iteration of data collection. Again, information was gathered that was now used to adjust the process models created in the first iteration. This process continued until the company supervisors agreed with the process models build in the latest iteration. Within company A, the first session with the company supervisor resulted in a list of 9 persons. Within company B, the initial list of persons of interest included 7 persons. The initial discussion sessions were all conducted using a semi-structured discussion protocol. The discussion sessions ranged in duration from 30 minutes to one hour on average. The process modelling effort at both companies shows that input from multiple stakeholders and an iterative approach is needed to get accurate process models. Using the input from multiple stakeholders singled out contradicting views on a process. In the discussion sessions we focused on a number of process model characteristics such as: the release planning focus areas recognized or implemented, importance of decisions made in process steps, type of and frequency of (formal) techniques and tools used, (internal and external) stakeholders involved, etc.

From the discussion sessions on the release planning process models of company A, we summarize two types of results. On one hand, we will present the identification of capability ratings for the distinct release planning focus areas, and on the other hand we will address interesting

benefits of the usage of the process models. First, see Table II (underlined ratings), the capability ratings:

- A grouping based prioritisation method is often used, so capability B of requirements prioritisation is achieved.
- Based on formal cost-benefit criteria for prioritisation level D is also achieved. Level A and C are skipped since not all internal stakeholders provide input on the priorities and external stakeholders are not involved in the prioritisation process.
- An open-ended release planning technique is used, and no formal release definition is formed. As a consequence none of the capabilities of release definition are achieved.
- There exists hardly a release definition. This has as consequence: none of the capabilities for release definition validation have been achieved.
- No formal scope change management exists. When development on projects of features turns out to be underestimated it can be chosen to simply not release yet or exclude it from the new version.
- New products are first thoroughly tested internally and externally, thus achieving capability A and B for build validation.
- Internal stakeholders are informed about a new release by means of a formal release document. Capability A in launch preparation is thus achieved. However, the release decision is not based on formal quality rules, and therefore capability B is not achieved.

Regarding the benefits of using process models in company A we can give the following example: based on the multiple iterations of discussing process models with different stakeholders, it appeared that alternative routings were possible in the initially developed process models, e.g., request handlers often consulting sales managers for a second opinion regarding their decisions. Only because of these iterations important business process details could be identified. However, it has to be stated that in total, the release planning process at company A didn't strongly benefit from using process models. Although the various process models were slightly adjusted in subsequent iterations, this didn't lead to big changes in the maturity ratings.

Regarding the capability ratings, from the discussion sessions in company B, we give the following results; see Table III.

- Regarding requirements prioritisation, internal stakeholders are being involved and a formal prioritisation method is often used. Also a cost-revenue consideration is being made. As a consequence levels A, B and D have been achieved. Because customers are not being involved in the process, C is skipped.
- The release proposal compiled by the Product Management fits the descriptions of capability A and B of release definition.
- The release definition has to be approved by a formal Strategic Product Board thus achieving capabilities A and B of release definition validation. Capability C is

not achieved because the release definition is not communicated to internal stakeholders.

- Having implemented a formal project management methodology, the company meets capabilities A and B of scope change management.
- Regarding the release preparation process a tool has been developed called the 'release clock'. The release clock defines that new features are first tested internally and consequently in a field test, thereby achieving levels A and B of build validation.
- The 'release clock' also defines a rigorous launch preparation process which includes all the capabilities of launch preparation.

Regarding the experienced benefits of the usage of process models in company B we also experienced the advantages of the multiple iterations in discussing the process models with different stakeholders. For example, in company B, it became clear, only after a couple of iterations that an automated requirements gathering system was hardly used in practice and was not favoured by most of the employees. As a consequence, we decided to exclude this system, which was formally specified in the company process standard, from the process models. However, also in company B it appeared that the usage of process models also can have disadvantages. E.g., the 'build validation and launch preparation processes' would have required very much effort to capture in process models, while the existing and available process documentation was of sufficient quality to base the maturity rating on. Summarizing, we can state that the usage of process models has clear advantages in particular process areas, but when applied 'at random' to any process it also can have serious drawbacks, e.g., too time-consuming. too cost-ineffective.

IV. CONCLUSIONS AND FUTURE WORK

The development of software process models in the case study provided detailed and in-depth information on the capabilities of the release planning focus areas. The maturity matrices of the release planning process of both companies could be completed in a reliable and detailed way. In particular, the iterations in the discussions on the process models, with the different stakeholders, resulted in renewed insights into the current practice, e.g., with respect to existing but unused tools. Of course the detailed arguments for the capability ratings are an important add-on to the Maturity Matrices in Table II and Table III. They clarify important and detailed aspects of the release planning processes. The use of a focus area oriented SPM Maturity Model, instead of a generic software process maturity approach such as CMMI, proved to have strong advantages regarding the detailed information of strengths and weaknesses of the release planning process and its focus areas.

However, the usage of process models also showed sometimes disadvantages. In particular, we mention here the effort which is needed to develop (and maintain) the process models. From our case studies we conclude that the appropriateness of using process models depends on

particular characteristics of the process and the business context, e.g., the complexity, the dynamics, and the number of stakeholders involved in a process. In further research, we will focus on these characteristics in order to become able to determine the suitability of using process models to particular types of processes and to different types of business situations. In that way, we will strive at a more efficient usage of process modeling for software process maturity rating.

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TABLE I Example of a Release Planning Part of the Maturity Matrix for Software Product Management (Van de Weerd et al, 2010)

	0	1	2	3	4	5	6	7	8	9	10
Release planning process											
Requirements prioritisation			A		B	C	D			E	
Release definition			A	B	C				D		E
Release definition validation					A		B		C		
Scope change management				A		B		C		D	
Build validation					A		B		C		
Launch preparation		A		B		C	D		E		F

TABLE II. RELEASE PLANNING PROCESS MATURITY AT COMPANY A

	0	1	2	3	4	5	6	7	8	9	10
Release planning process											
Requirements prioritisation			A		**B**	C	**D**			E	
Release definition			A	B	C				D		E
Release definition validation					A			B		C	
Scope change management				A		B		C		D	
Build validation					**A**			**B**		C	
Launch preparation		**A**		B		C	D		E		F

TABLE III. RELEASE PLANNING PROCESS MATURITY AT COMPANY B

	0	1	2	3	4	5	6	7	8	9	10
Release planning process											
Requirements prioritisation			**A**		**B**	C	**D**			E	
Release definition			**A**	**B**	C				D		E
Release definition validation					**A**			**B**		C	
Scope change management				**A**		**B**		C		D	
Build validation					**A**			**B**		C	
Launch preparation		**A**		**B**		**C**	**D**		**E**		**F**