Lessons learned from best practice-oriented process improvement in Requirements Engineering – A glance into current industrial RE application

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Motivation

The increasing awareness about the importance of requirements engineering (RE) has tempted many enterprises to invest effort in the improvement of their corresponding RE processes. Many small and medium sized enterprises (SME) have less budget and effort available for improvement work and lack the in-house competence to make the improvements on their own. To compensate the lack of know-how in RE, many companies hire consulting companies or academics to assess the companies RE capabilities and to make improvement suggestions. This paper presents some lessons learned from several RE process improvement case studies with SME's applying the Fraunhofer IESE ReqMan approach of best practice-oriented RE process improvement. More results and details on the case studies can be found in [1].

Introduction

Requirements Engineering (RE) has been recognized as an important discipline to assure successful projects and resulting products. The ReqMan[1] research project [2] aimed to facilitate RE process improvement and its acceptance in SMEs by addressing their specific needs in process improvement. The ReqMan approach explicitly integrates the employees into the improvement process, enabling them to make improvement decisions themselves, and not having the decisions solely made for them by external consultants.

A common drawback of requirements engineering process improvement by SMEs is the company's lack of know-how in Requirements Engineering techniques and best practices as well as the limited budget and schedule for improvement tasks. Thus, many companies hire consulting companies or academics to assess the companies RE capabilities and to often make short-term suggestions on how to improve the Requirements Engineering processes. However, this faces consultants and researcher from academia with the challenge to identify the concrete needs of the particular company regarding the existing specific context and to choose appropriate solutions that can be adapted without significant modifications towards the given constraints.

We've applied our requirements engineering improvement approach ReqMan [3], based on existing RE best practices from academia and from industrial experience, several times during the last two years. In the remainder of this paper, we will present lessons learned from several RE process improvement case studies with SME's applying the Fraunhofer IESE ReqMan approach.

ReqMan – a best practice-oriented Requirements Engineering improvement method

The ReqMan approach [3] provides a set of 36 (best) practices and related techniques that have been gathered from established RE literature and other approaches such as CMMI or SPICE, and, that have then been evaluated by industrial and scientific RE experts during the last years. The ReqMan framework distinguishes phases, practices, and techniques. Phases are abstract activities, e.g., "Requirements Elicitation" or "Requirements Specification". They allow clear focusing on process parts but are too abstract with regard to assessing whether they are sufficiently implemented. Therefore, each phase includes a set of practices that concretize which activities have be done within this phase in order to establish state-of-the-art RE, e.g., "Elicit non-functional requirements". However, practices still focus on the "what" and not on the "how". Finally, techniques give clear information on how a practice can be implemented.
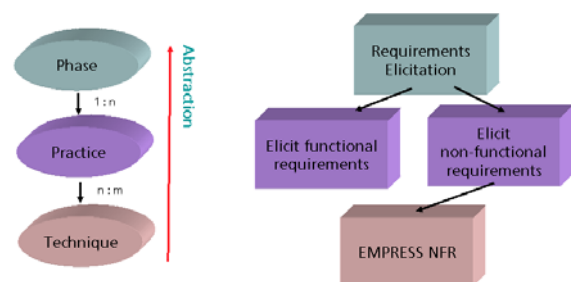

Figure 1 - ReqMan approach

Case studies

We applied our ReqMan RE process improvement approach in eight different case studies with international small and medium sized enterprises. All application cases were focused on real-life projects, developing products for customers. The application domains of the case studies are wide spread, ranging from typical information system domains, like financing or social networking systems, to classic

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embedded system domains like automotive and consumer electronics products.

Analysis and Results

Even though the results of our analysis do not allow highly generalized statements about the state-of-the-practice, the analysis points out tendencies in requirements engineering application that apparently exist in industrial practice. We will provide some major conclusions in the remainder of this paper. More results and details on the case studies can be found in [1].

Q1. Which practices have apparently found their way into industry?

To answer this question, we took a look at all ReqMan practices that are performed by at least 80% of our case study companies.

In the phase of elicitation, "identify stakeholder", "elicit goals", "elicit tasks and business processes", and "elicit functional requirements" are apparently the practices which have been established in industrial RE processes. For specification, there is a high awareness that the practices "document customer requirements", "document developer requirements", and "use standards and document structures" are actually necessary. Furthermore, "review requirements" and also "validate usability" seem to be widely applied for validation purposes in practice. Finally, the practices "manage requirements changes", and "prioritize and negotiate requirements" are apparently part of today's requirements management practice. In the area of analysis, however, no ReqMan practice seems to be widely found their way into industry, at least in our case study companies.

Nevertheless, we can state that there is apparently a great awareness in industry for most basic practices provided by ReqMan and similar "good practice" proposals.

Q2. Which practices seem to be worth improving?

In this case, we considered all practices where at least 75% of the companies thought about improvement.

Interestingly, we found out that not all practices which are problematic are also considered candidates for a near-future-improvement program. The "top four", i.e., the four practices where most of our case study companies plan to make improvements as soon as possible are "elicit functional requirements", "elicit non-functional requirements", "review requirements", and "document developer requirements", thus, four practices that have seemed to be well solved for a long time already from a research point of view. However, these four practices are apparently considered as the most crucial ones with regard to a successful RE process, and an improvement of all other problematic practices seems to make only sense in industry when the four "core" practices are well established. A good example is "assure traceability". Only 50% of our case study companies perform this practice, and all of these 50% have significant problems. However, only one case study company plans to improve this practices in the near future.

Q3. Which practices have apparently not found their way into industry yet?

To answer this question, we take a look at all ReqMan practices that are performed by less than 20% of our case study companies, and that are neither planned for improvement nor for introduction.

Basically, these practices are "formal modeling", "formal verification", "reuse requirements", "manage variability", "model user behavior" and "view based documentation".

While there are good reasons from an academic point of view to apply these practices, there has still been no awareness in our case study companies that these practices could make sense also for them. Beside the fact that these practices might be strongly context-dependent and thus not applicable for all companies, it could also be that they require an investment that many organizations are not willing to spend.

Conclusion

Based on the feedback data from the participating companies, we tried to analyze the current situation of industrial RE application and to support the identification of current RE "hot topics" of RE practitioners. This might support researchers in focusing their future work and consulting activities.

One major additional insight we received from these studies is that although the necessity of requirements engineering "basic" practices is recognized by most industry companies, the required expertise and know-how on how to implement the practices successfully is still a challenge for them. One of the major obstacles that was mentioned by and has to be tackled by industry is to identify the adaptation needs and required modifications within the given organizational context. Many existing state of the art techniques still require significant tailoring and experience prior application.

Referenzen

[1] S. Adam, J.Doerr, M.Eisenbarth," Lessons learned from best practice-oriented process improvement in Requirements Engineering – A glance into current industrial RE application", Proceedings of the 4th International Workshop on Requirements Engineering Education and Training, 2009.

[2] Ehresmann et al: Bausteine zur Optimierung von Software-Entwicklungsprozessen: Agiles Anforderungs- und Wiederverwendungsmanagement für kleine und mittlere Unternehmen; Stuttgart : Fraunhofer IRB Verlag, 2007, ISBN 978-3-8167-7271-2.

[3] T. Olsson, J. Doerr, T. Koenig and M. Ehresmann, "A Flexible and Pragmatic Requirements Engineering Framework for SME", Proceedings of the 1st International Workshop on Situational Requirements Engineering Processes, 2005, pp. 1-12.