

An Empirical Evaluation of the Process Workshop Approach

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Abstract. Electronic process guides are a commonplace for software organizations. Developing useful process guides is, however, often a difficult and laborious task. Process Workshop is an approach designed to facilitate the development of process guides. Yet, there is still little empirical knowledge available on the Process Workshop approach. This paper reports the empirical results of a case where the Process Workshop approach was used in a real setting. Based on the empirical results, the approach was found efficient in initiating the actual process design activities. The resulting processes were formed collectively based on rapid feedback from future process users and on face to face communication between development team experts. The results suggest that the process workshop approach may enhance the motivation of experienced developers who otherwise find traditional software process improvement activities less motivating. The Process Workshop, although not answering all the organization improvement needs, provides a good starting point for the process development work. Problems in the approach are identified and the respective lessons-learned are described.

Keywords: Electronic process guide, process workshop

1. Introduction

The electronic process guide provides an effective way of making process models, examples and templates available for software development projects [2, 3]. Most often, software process improvement (SPI) work produces an electronic process guide, which should be based on the experiences gained and improvement needs determined during the software development process. Effective and useful guides are difficult to compose and often expensive to maintain [1]. One of the principal problems in software process improvement is concerned with creating commitment towards SPI involving all parts of the organization [4]. Furthermore, developing useful process guides meeting the needs of different software development projects is a challenging task [5]. To meet these challenges, Dingsøyr and Moe [1] have proposed the Process Workshop approach to facilitate the development of electronic process guides in small software companies. This approach can be seen as a light way of developing processes based on the needs of the organization. The approach also enables rapid feedback from future process users and face-to-face communication between developers and improvement team [6].

In the literature, there is little empirical evidence available on the actual development of electronic process guides. Some process development approaches and tools exist, however. The Spearmint Approach to Software Process Definition and Process Guidance [2, 3] supports the modeling and online-documentation of software development processes from a software engineering perspective. The Spearmint has been tried out and tested in several different environments including Extreme Programming (XP) [4] based development setting [2]. The use of Spearmint requires the adoption of a tool that supports the process design. The case company did not, however, want to commit to any particular tool-based process design approach *a priori*. The Process Workshop Approach [1] is designed to facilitate the development process. It is based on intense collaboration, paper and pen techniques and rapid feedback cycles. Little is known empirically about the validity of the approach, however. Empirical evidence is valuable for researchers and practitioners alike. For researchers, it provides a reference point and opportunities for theoretical development, while for practitioners, it offers practical guidance in terms of how, what and when, and in which context the approach works.

The case company is a software development organization with 70 developers. Prior to the case study, the organization had not been providing any systematic, explicit or organized guidance for their product development processes. The case organization was using various undocumented software development practices and processes in different product development and subcontracting projects. Majority of the software development practices and processes were directly based on customer demands and requirements. One of the aims of the case organization was to increase their capability also in terms of CMMI [5] maturity levels. Therefore, the software process improvement work was started with a CMMI based assessment. During the CMMI assessment, the key strengths and the improvement opportunities of the case company were analysed. The key findings of the analysis were an inconsistency of software development practices within the organization and a lack of systematic explicit process documentation. It was agreed that an efficient process guide is needed to provide support for the development work in the case company. In practical terms, this guide would help develop software more systematically, while also enabling new employees to become productive faster. Therefore, there was a strong case for 1) collecting information of the best working practices of the different projects, 2) defining an electronic process guide and 3) creating commitment for piloting the created process model in selected projects. A decision was made to adopt the Process Workshop approach [1] to continue the process development work.

The purpose of this paper is to report the results of the key empirical findings on the use of the Process Workshop approach in a small company. Thus, the paper focuses on process construction (i.e., how the process is developed), while paying less attention to the process description (i.e. how the process is described). The empirical results include the benefits and problems found during the process workshop. The lessons-learned are also identified.

This paper is composed as follows: section 2 presents the background for the Process Workshop approach. The third section provides a description of the research method used. The fourth section discusses the results. The last section concludes the paper with final remarks and outlines future actions.

2. Process Workshop Approach

This paper is based on the assumption that an electronic process guide provides a means of making processes available to software developers. It has been argued that the electronic process guide would be an efficient way of enhancing the development processes for a software company [2]. Therefore, the challenge for an organization is to define simple and yet realistic process models that include the most important activities and work products. The software developers' commitment to using the defined process guides is also essential. Dingsøy and Moe [1] have developed the Process Workshop approach to support the development of electronic process guides. The basic idea in the Process Workshop approach is to define the most important processes in several workshops in cooperation between the software developers and the improvement team. The Process Workshop aims at defining the key processes for a company through effective use of simple visual models [1].

The process workshop approach includes six major steps: (1) decide processes, (2) invite participants, (3) hold the Process Workshop, (4) appoint the responsibility for implementation, (5) appoint the responsibility for reviewing process results, and (6) implement process in organization [1]. Steps 1 and 2 prepare for the Process Workshop. In the first two steps, the improvement team selects the most relevant process areas for further analysis, invites experienced developers to join the workshop and takes care of all preparations concerning process worksheet, meeting room, yellow labels, wall papers and the like. [1].

During the Process Workshop, the first activity is to hold a short presentation on the goals and activities involved in the Process Workshop. The second step includes the generation of inputs, outputs, roles and documents related to selected process areas. The results are recorded on a pre-laid out process worksheet (Figure 1). Inputs and outputs are generally documents (or code) that should be available for the processes. Roles (e.g. developer, project manager) are the persons who should contribute to the activities defined. [1].

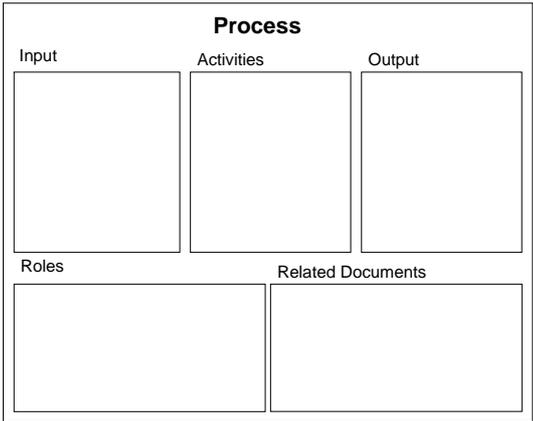


Figure 1 Process Worksheet [1]

After the workshop, the responsibilities are assigned for implementation, review and deployment within the company. The responsibilities for process guide reviewing and piloting are, if possible, divided among the participants. The existing processes are updated and new ones defined based on the results of the Process Workshop. The developers are

involved in the workshop, thus having an opportunity to contribute to the content. The results are piloted in participants' projects. Dingsøy and Moe [1], who have tested the Process Workshop approach in several small software companies, suggest that the Process Workshop approach enables the companies involved to improve their software development and organizational learning capacity.

3. Research Approach

The research was performed using the Action Research method [6]. Action research is an iterative process including problem diagnosis, action planning, action taking, evaluating and specifying learning by the researcher and the participators [6]. In this study, the research problem is to find a systematic way of defining electronic process guides. The Process Workshop can be seen as a social process, in which the selected software processes are defined in cooperation between researchers and case organization developers including the improvement team.

The case organization is a rapidly growing and successful software company operating in the mobile and wireless sector. The case company had not been using any consistent, systematic process models. Rather, their development relied on highly competent and experienced development staff. Moreover, majority of the development work was done at customer premises with customer's processes. There existed a business pressure to move the development to their own facilities, which motivated the company to initiate the process development project. The aim of the improvement team's work was to collect and analyse the software development practices used, to determine the most appropriate ones, and to define a working process model for the case company so as to support the practical work of software developers, thus also contributing to their learning process.

During the action planning phase, the Process Workshop approach was tested by the improvement team for one process. The approach was found feasible, while requiring some modification before it was applied. An alternative solution for process definition would be to use assessment findings for generating processes with the improvement team. This would be the traditional approach. However, being based only on CMMI findings, this approach would lack the knowledge and experience provided by developers. This would give rise to a risk of the approach not providing adequate support for the daily working practices of developers and their commitment to further piloting actions. Therefore, the traditional approach would not provide adequate answers the research problem.

The Process Workshop was carried out as one of the activities within the software process improvement work of the case company. The whole process of process development involves a range of different activities such as process definitions, piloting planning and planned deployment actions along with further process workshops. After the planning phase, a three-hour workshop was implemented (action) by 11 representatives of the case company and three researchers. The results reported here concentrate on one action research iteration. Future research will focus on evaluating the practical feasibility of the defined processes based on the piloting results, and testing the Process Workshop method in other case studies.

The improvement project progressed as follows. The process started with a traditional process assessment, which was mainly performed using CMMI level 2 process definitions. Due to frequent changes in the software development requirements and incremental development needs, also agile methods [7] and principles (www.agilemanifesto.org) were

used in performing the improvement idea analysis. The assessment included eight interviews. The interviewees were project managers and developers working in different product development and customer subcontract projects within the organization. During the process assessment, a number of useful improvement ideas were found. The assessment results were used for forming the basis and starting point for the Process Workshop.

As stated above, prior to the workshop, the process workshop approach was piloted by the process improvement team. The process definition trial was carried out for the general project management process. The approach seemed to work adequately as a data collection and analysis method even if it proved difficult to define the differences between the related documents, inputs and outputs. Therefore, it was decided to define the inputs, outputs and the most suitable tools for each process area separately. In this phase, the improvement ideas, workshop goals and the used process workshop approach were also presented to the interviewees. The project managers and developers defined the most important process areas for the process workshop. In this analysis, daily project management, code and document inspections, and release building and testing were seen as the most important processes to be defined in the electronic software development process guide. The workshop schedule was based on a redefined agenda, which also included a time schedule for presentations and process definition.

4. Empirical Results

4.1 Progression of the Process Workshop

During the process workshop, a brainstorming technique called Idea Walk (developed by Roope Kylmäkoski, Nokia Corporation) was used. In the first phase, the participants had a 10-minute session of walking around the meeting room, without discussing with each other, writing down their ideas on process activities, inputs, outputs, related tools, and roles on labels, which they then put them on wall boards (Figure 2).



Figure 2 Progression of the Workshop

In the second step, the employees of the case company were divided into groups of three persons. All groups spent about fifteen minutes analyzing each of the defined processes. During the analysis, the activity, input, output, tools and role labels were transferred, generated and removed on the process wall boards. As a result of the analysis, eight processes

of daily project management were defined: code and document inspections, change management, module, integration and system testing, and release building (Figure 2).

It was decided that the defined process model drafts would be reviewed, written in electronic format and piloted in case projects. After the process definition, each participant selected one of the defined process models to be reviewed and made an early commitment to pilot it in their software development projects.

4.2 Analysis of the Process Workshop Results and Key Findings

As a result of the empirical evaluation, it was found that the process workshop provided a light way of developing processes based on organization needs, while also enabling rapid feedback from future process users. During the workshop, eight process drafts were defined and analyzed in two hours. The used brainstorming technique (Called Idea Walk, idea definition with no discussion and then analysing in three-person groups, one process at a time) proved a highly efficient way of defining processes.

After analysing the CMMI assessment results, the process improvement team identified project management, requirements and changes as the most important processes. Project managers, however, considered it of primary importance to define consistent guidelines for the process areas that had the greatest direct impact on their daily software implementation activities. The defined processes were code and document reviewing, release building, testing and daily project management. Since the project managers were actually participating in the process definitions, they were also motivated to use the defined processes in practice in their projects.

The Process Workshop approach was seen as beneficial for the case company. The benefits of the Process Workshop approach are listed in the following.

- A fast and effective way to define different processes requiring little time
- Commitment for process review and piloting are ensured during the workshop
- The technique worked best when defining such process models that affected the implementation directly
- The process worksheet is an efficient way to standardize terminology and different working practices
- The Idea Walk technique makes it possible to define several processes at one workshop
- The Process Workshop can be supported with traditional assessment findings, making sure that the developed processes are in line with the most important improvement ideas as defined for the software development projects of the organization.
- The Process Workshop method supports organizational learning
- The results help the developers in their daily software development work

Based on the case experiences, it was found that using the Process Workshop approach many processes could be defined quickly and with relatively little time. As a result of the workshop, according to the comments of the management of the case organization, the project members had a strong commitment to reviewing process guidelines and piloting, and the people who had the most knowledge of the processes had been sharing their knowledge of the different working practices. This was found to enhance organizational learning and to efficiently support the definition of a common terminology and processes in a small organization, based on the organization's own best working practices and CMMI assessment results. The technique, however, proved to work best when defining such processes (e.g. code inspections and release building (example in Figure 3)) that affected the software

implementation directly. The Idea Walk technique made the workshop even more efficient while also making it possible to several processes in one workshop.

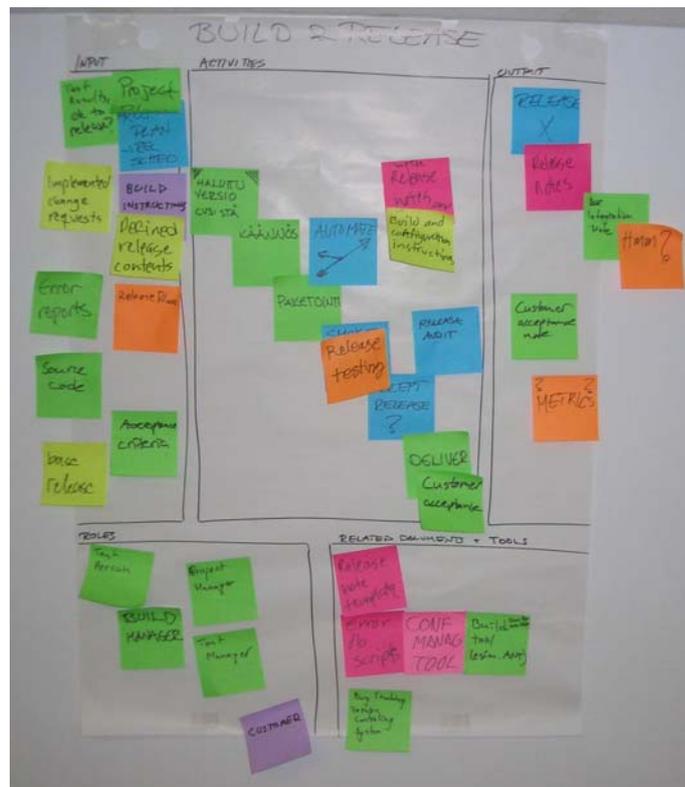


Figure 3 An example of release building process

In the created release building process (Figure 3), the defined activities were 1) selecting the right version of the version management system, 2) automated release building, and 3) release note creation, 4) release testing, 5) delivering the release, and finally, 6) acquiring release acceptance from the customer. The inputs were: project plan, change requests and release plan, error report, and source code. The outputs of this process were: release, release note and customer acceptance note. The purpose of the defined process is to serve as release building instructions for new software developers at the case company.

Compared with the experiences gained with earlier Process Workshops, the empirical results seem to support the findings made by Dingsøy and Moe [1] of the Process Workshop as an efficient way of defining processes and supporting project employee learning. During the process workshop case study evaluation, however, also a number of problems or negative findings were also encountered:

- There was no time to discuss the improvements or process results together with the whole workshop team
- The defined processes are just drafts still requiring further analysis workshops and review cycles.
- Workshop results are laborious to document in the final electronic format.
- The project members do not have such a high motivation to review or pilot the support processes that do not directly affect their software implementation activities.
- The process definition can be difficult and it takes more time if the projects involved have highly different working practices (e.g. both plan driven and agile methods) and terminologies.
- The general level assessment findings may prove difficult to connect with detailed level process models. Not all of the improvement ideas can be addressed by the process models defined in the process workshops.
- The process workshop provides a good starting point for organization improvement work. However, the practical implementation of the improvement still requires further analysis and documentation work.

The key problems encountered with the process workshop approach were that, firstly, there was no time for an in-depth discussion about the improvements and process results together with the whole workshop team after the definition, and, secondly, process definition can be a difficult task, requiring more time if the working practices and terminologies of the projects involved differ greatly. Such was the case, for instance, when the different projects were employing highly different module testing tools and integration environments. In our case, an attempt was made to address this problem by dividing testing activities into smaller process areas, which were module, integration and system testing. In addition, the daily project management process (one of the processes selected at the beginning of the workshop) proved difficult to be limited to covering daily activities only. It was, however, easy to keep daily project management activities separate from weekly or monthly practices. Some projects had daily meetings (e.g. one Scrum project had daily meetings), while most of the plan driven projects only met weekly. These different projects would thus also require different process models.

It may be difficult to connect general level assessment findings with detailed process definitions at implementation level. Furthermore, not all the found improvement ideas can be adequately addressed by the process workshop technique. Although some drafts of process guidelines for the organization were drawn out (collected and preanalysed data from managers and developers) as a result of the process workshop, further analysis and definition workshops are still needed to achieve adequate electronic process definitions.

The Process Workshop approach combined with the Idea Walk technique proved to be a suitable approach for motivating experienced developers who might be biased against software process improvement activities because of failed improvement projects in the past. Even though this technique provided promising results, it did not result in any ready-to-be-deployed material. It did, however, provide a good starting point, with a lot of documentation and refinement work still to be done. In future, the process improvement endeavour started in the case company will be continued, using both the Process Workshop approach and the Rapid7 [8] workshop method. The Rapid7 method has two key benefits compared to the Process Workshop approach of Dingsøy and Moe [1]. Those benefits are to be found in the results yielded by a deeper analysis performed during the workshop and in the implementation of the final document (e.g. electronic process guide) version during the workshops.

5. Conclusion

Process improvement projects in the field of practical software development have been successfully carried out in many organizations during the past decade [9]. Often the target of the software process improvement (SPI) work is to come up with an electronic process guide which should be based on the experiences and improvement needs accumulated through the software development process. This paper has maintained that effective and useful guides are difficult to develop and often expensive to maintain.. The Process Workshop [1] is a promising approach, the main virtue of it being that it facilitates the development of electronic process guides for small companies. It offers the mechanisms required for defining the most important process models in workshops in cooperation between the software developers and the process improvement team.

The purpose of this paper was to present the results and the empirical findings of using the Process Workshop approach in a small software development company with a high level of competence, operating in the mobile and wireless sectors. As a result of the empirical experiment, the Process Workshop approach was found a light way of developing processes based on the needs of the organization, while also enabling rapid feedback from future process users and face to face communication between experienced developers and improvement team. This approach may also help to increase software developers' and project managers' commitment to reviewing and piloting defined processes. The case evaluation further indicated that the process workshop approach worked best with the processes that directly affected the participators' daily software implementation activities. The process workshop was also found to provide a suitable venue for supporting common terminology and defining the working practices within the organization.

The results also demonstrate that it may sometimes be laborious to generate process definitions in process workshops drawing upon highly different project practices and terminologies. It can also be difficult to associate general level assessment findings with detailed implementation level process definitions. Furthermore, the defined process drafts still require further development before they are ready to be piloted..

As a result of the process workshop, process drafts for some specific areas are now available to the case organization. The Process Workshop can be seen as a good starting point for the actual software process improvement and piloting work. Combined with the Idea Walk technique, it proved to be a suitable approach also for motivating experienced developers who might otherwise have a bias against SPI activities, because of failed SPI projects in the past. In spite of the promising results, the endeavour did not produce any ready-for-use electronic process guides. Further improvement activities and several workshops are still required for fulfilling the improvements needs identified in the CMMI assessment and for obtaining a serviceable electronic process guide. Thus, the process improvement at case company is to be continued in the future, using both the process workshop approach and the Rapid7 [8] workshop method for the final electronic process guide analysis and documentation.

Aknowledgements

This research is supported by AGILE-ITEA research project. The research was conducted in co-operation with VTT Technical Research Centre of Finland and Vega Technologies. Acknowledgement to all the employees of Vega Technologies who participated in the activities of the improvement project. Thanks also to Outi Salo of VTT of her valuable comments to the paper.

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