Experiences Gained from Applying ISO/IEC 15504 to Small Software Companies in Brazil

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Abstract

This paper describes some experiences gained from applying ISO/IEC 15504 for software process assessments focusing on process improvement in four small software companies in Brazil. The assessments have been realized in the context of the research project 15504MPE, which aims at the development of a customized assessment method based on the standard ISO/IEC 15504 adapted to small brazilian software companies. The paper reports some of our experiences regarding the application of the standard especially to this kind of company. Costs and benefits related to the assessments are also presented. [1]

1. Introduction

Today, small and micro[2] software companies are important for the Brazilian economy, as, for example, in the software sector they represent about 70% of the total number of companies and employ a great share of people [4]. Typically, this type of company faces similar problems as any type of company, e.g., regarding the quality of their products, although, in general, SCs normally face these problems to an extreme due to the informality of their processes and lack of resources. These characteristics can harm SCs in relation to their quality, productivity and competitiveness, or even their survival on the market. Therefore, the identification of problem areas and the systematic establishment of improvement actions are vital for their long-term success.

However, most of the software improvement and assessment approaches are directed principally at medium or large organizations, which makes their application in small companies difficult. For example, in 1999 only 7% of Brazilian SCs had realized an ISO 9000 or CMM assessment. This shows that although possible, the adaptation of these models requires considerable effort and expertise, which impedes their broad application in small software companies.

In this context, the research project 15504MPE [3] focuses on the development of an assessment method customized to small software companies in order to enable an effective assessment directed to their needs at low cost. The research project has been initiated in February 2003 and during the first semester, 4 trials have been performed in order to gather experiences about the application of the standard 15504 in this specific type of company. In this paper, we present the experiences we obtained in these trials regarding cost and benefits and the process assessment model itself.

2. Execution of the Assessments

In the initial phase of the research project 15504MPE, we ran assessments in 4 small software companies in Florianópolis, Brazil. The primary objective of these assessments in the context of the research project was to

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[2] A common definition used in Brazil classifies companies, as micro companies with less than 10 employees and as small companies with 10-49 employees [4]. However, as internationally usually a company with less then 50 employees is classified as small, without separating micro companies, we also use this classification for small software companies (SCs) in this paper.

gain experiences in the application of ISO/IEC 15504 regarding its application in this type of company as a basis for the development of a customized assessment method.

The process assessment model

The process assessment model used is based on the exemplar model of Part 5 of ISO/IEC 15504. The capability dimension from Part 5 was translated and adopted basically as-is, considering levels 1, 2 and 3. The process dimension was also based on the ISO/IEC 15504 exemplar process assessment model in Part 5, using basically the 1998 TR version in the first case study and the 2002 version in the other case studies. All assessments have been realized in conformity with the requirements of ISO/IEC 15504, based on the objective to experiment with variations of the method in the context of the research project 15504MPE.

The assessment process

In each assessment, prototype versions of the assessment method to be developed have been used. These versions are based on a general assessment method developed by CenPRA [5] based on Part 2 of ISO/IEC 15504. The assessment process that has been used is based largely on the process defined in ISO/IEC 15504 divided into: Planning, Data Collection, Data Analysis, Data Validation, Process Rating, and Reporting.

During the planning phase, the assessment has been organized and planned considering the definition of resources/responsibilities and schedule. The planning phase also included the preparation of the documents required for the assessment, e.g., presentation material, as well, as a template for the report to be produced. During this initial phase, a characterization of the company was also done using a questionnaire, in order to gather a basic understanding on the company and its principle product. The characterization served also for the selection of the relevant processes and the respective capability levels to be assessed.

Immediately before the data collection, ISO/IEC 15504 was briefly presented to all people involved in the assessment. The data collection was done by interviewing representatives from different points of view of the company (e.g., director, programmer) and analyzing documents produced during the processes. Afterwards, the assessors analyzed the data collected by mapping the observations to the selected processes from the process assessment model. These evidences were then revised by the representatives of the company in order to check if the processes in place had been understood correctly by the assessors. Then, the processes were rated by consensus of the assessors based on the validated evidence. The resulting process profiles were presented to

the representatives of the company. In addition, strengths and weaknesses, as well, as potential risks and improvement suggestions were presented based on the assessment results and discussed with the companies' representatives initiating the definition of improvement actions. Finally, a report was prepared, which, in conformity with 15504, describes the planning and execution of the assessment, as well, as the results, including the process profiles, strengths and weaknesses, risks and improvement actions.

3. Context

Following, we briefly describe the context of the companies in which the assessments took place. For reasons of confidentiality, the names of the companies are omitted.

Company 1

The company focuses on software development in two areas: individual solutions developed for the requirements of a specific customer and management systems, principally for internal use which may also be commercialized in the future. The company was founded two and a half years ago including at the time of the assessment a total number of 5 people, being 2 of them part-time workers. One of the priorities of the company for improvement is cost reduction.

For the assessment, two processes have been selected in discussion with the directors of the company (based on the exemplar process assessment model in ISO/IEC15504-5 version 1998): Supply and Project Management. The processes have been assessed up to capability level 3. The assessment has been realized basically in two days (not including the preparation of the final version of the assessment report). Four assessors realized the assessment (as one of the objectives was also to train part of the assessment team) and three representatives of the company participated.

Company 2

This company develops software in the area of commercial and industrial applications, as well, as in the health domain. The company principally develops customized software, as well, as also standard software. The company is very small with only two people having been founded only one year ago. The improvement focus of this company is principally on increasing productivity and usability of their products, as well, as the control of the development process.

For the assessment based on the exemplar process assessment model defined in ISO/IEC15504-5 the following processes have been assessed up to capability

level 3: Supply (version 1998), Project Management (version 2002) and Software Construction (version 2002). The assessment has been realized basically in two days. The assessment has been performed by three assessors and with the participation of the two people of the company.

Company 3

The principal product of this company is a customizable standard information system for companies in the metal-mechanic and electro-electronic sector. In this context, the company principally focuses on support and maintenance of this product. The company was founded in 1998 and has 11 employees, eight of them being part-time employees. One of the most urgent improvement goals is cost reduction and schedule accomplishment.

During the assessment, the following processes were selected based on the exemplar process assessment model in ISO/IEC 15504-5: Supply (version 1998), Customer Support (version 2002), Project Management (version 2002) and Software Construction (version 2002). The processes have been assessed up to capability level 3. The assessment has been realized in two days, involving 3 assessors. During the data collection and validation 4 representatives of the company participated. The results have been presented to the director and all employees of the company.

Company 4

This company is specialized in services for data communication offering solutions for B2B and B2C. The company has been founded in 2000 and is rapidly growing with today about 56 employees[3]. The primary business model of the company is services, requiring the development of software as a basis for these services. Various difficulties have been observed especially related to its fast growth, as well, as required technology changes in order to stay competitive. First improvement actions had already been initiated in an unsystematic way, principally focusing on the formalization of management aspects.

During the assessment the following processes have been investigated up to level 3 based on the exemplar process assessment model in ISO/IEC 15504-5 (version 2002): Supplier Tendering, Contract Agreement, Software Release, Software Acceptance Support and Software Construction. The assessment has been realized in two days, involving 4 assessors following basically the

same process. However, because of the larger size of the company, the data collection was divided in various interviews in order to prevent problems due to the unification of people representing different levels of hierarchy. The validation and presentation of results has been done unifying all representatives at all hierarchy levels. In total, about 8 representatives of the company participated in the assessment.

4. Costs & Benefits

In general, all four companies considered the assessment as very beneficial and have already begun to implement improvement actions based on the results. The most important benefits observed are:

- Better understanding of the assessed processes based on the assessment results, as well, as due to the discussions of representatives from different points of views during the data collection of the assessment.
- Strengths and weaknesses of the assessed processes were identified in relation with the process assessment model.
- Suggestions for improvement with relevant impact on the software process were formulated and started to be implemented.
- Increased motivation for improvement due to a better understanding of the actual process and the identified weaknesses.
- Increased commitment to improve process quality.

Since the assessment itself does not directly lead to cost savings, the benefits to be derived are of qualitative nature and especially, due to the short time frame, no large-scale process changes for improvement could be measured.

Costs related to the assessment are basically personnel working hours. In general, we observed that the average total cost for the assessments is reasonable with about 80 person-hours summing the effort of all people involved. We observed that the total cost is especially influenced by the number of processes assessed, as well, as the size of the company, and consequently the number of representatives participating in the assessment.

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[3] This means, that, strictly seen the company at the time of the assessment would not be classified anymore as small. However, as only recently before the assessment several people were employed, the results of the case study are still considered relevant.
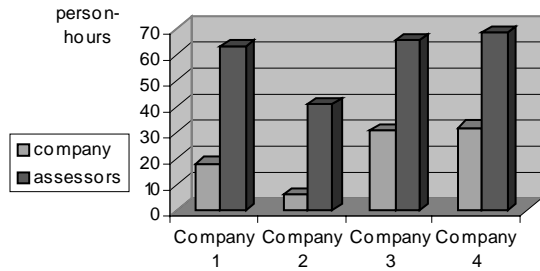
Figure 1. Assessment cost per company

The total effort spent by the companies' representatives with on average about 22 person-hours (summing up the effort of all representatives) is considered adequate. However, the effort of the assessors ranging from about 40 to 70 person-hours is considered still quite high.
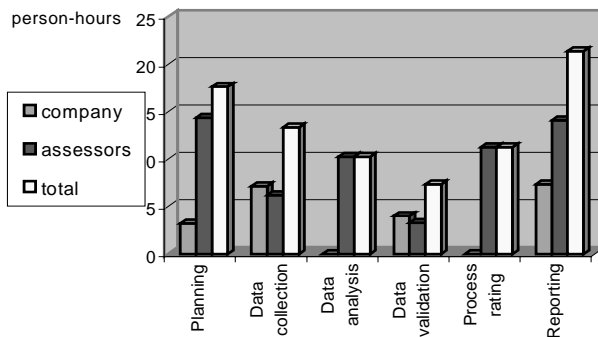

Figure 2. Average assessment effort per activity

Regarding the individual activities, we observed that on average the two activities, which most consume effort, are planning and reporting (including also the presentation of the results to companies' representatives). The planning activity consumed considerable effort from the assessors, specifically regarding the preparation of the assessment and the required documents. This effort is expected to reduce with increasing experience of the assessors and with the availability of document templates, as well, as document management support.

The reporting activity consumes considerable effort of the assessors, as well, as it requires experience. The activity appears especially effort consuming also for the companies' representatives due to the fact that sometimes a greater number or all employees are involved in the presentation of the results which, on the other side, contributes significantly to the dissemination of the results and enables already an initial discussion of improvement actions.

5. Experiences Regarding the Standard

The application of ISO/IEC 15504 for the assessment of software processes in the 4 small software companies indicates its applicability also in this particular context. Although, in order to further facilitate its application, the following observations have been made.

Assessment method: As assessment method, the method [5] developed by the CenPRA has been used and, in general, has shown to be adequate also in the context of SCs. However, we observed, that for a broad application in practice, it requires more detailed guidance, including the definition of guidelines (specifically for its adaptation to SCs) and templates for the documents to be consumed or produced during the assessment.

Besides this, we observed difficulties to efficiently select processes – as due to cost limitations – only very few processes can be assessed in detail. Therefore, a mechanism is required which helps to select the key processes based on the business goals and known problems in a specific company considering also their potential improvement benefits and costs. This is further complicated in SCs, as they are generally not explicitly aware of their business goals as a basis for the selection of the most relevant processes.

Another activity critical to the success and costs of an assessment are the interviews during data collection. The interviews were performed in an open style, not using any kind of questionnaire or checklist, based only on an interview plan, which lists all issues to be elicited during the interview. This was considered very adequate enabling a valid data collection, as the companies' representatives could freely describe how the processes are executed, leaving the mapping to the processes from the process assessment model to the assessors. This was considered especially important, as we observed a low level of Software Engineering knowledge among the companies' representatives and, therefore, their incapability to do this kind of mapping on their own. However, we observed that in order to be effective and efficient, more methodological support is required regarding the execution of interviews, especially in relation to the handling of group dynamics and to keep focus on the objective of the interviews.

In order to further reduce costs, the necessity for broader support for the documentation of the results of the data collection and the rating also have become clear.

Process assessment model: The performed assessments were based on the exemplar process

assessment model defined in 15504-5. The processes that have been assessed were considered adequately modeled. Only exception is the support process, which incorporates various aspects such as user training, support and evaluation of customer satisfaction, as well, as the monitoring of performance, which maybe could be better dealt with separately. Besides this, the exemplar process assessment model does not directly support certain processes related to specific types of software development, such as, e.g., product line management. Another difficulty is related to the division of the 1998 version of the Supply process into 4 new processes (version 2002). In the context of SCs, we considered it more adequate to differentiate only between two processes: one in the beginning of the project including Supplier Tendering and Contract Agreement, and one in the end of the project, covering Software Release and Software Acceptance Support.

Results of the assessment: As the objective of the assessments was on process improvement, we observed that besides the minimum requirements regarding the assessment output, principally including the process profiles, it is necessary to point out also the principal strengths and weaknesses related to the assessed processes, as well, as risks and improvement suggestions in order to provide initial support for the planning of improvement actions.

Document management: A great part of the effort of the assessors was spent on the management of documents produced during the assessment and the elaboration of the report. In this respect, we observed the need for systematic tool support for the management of the documents during all assessment activities and identified possibilities enabling the partial semi-automatization of the handling of information as a basis for the creation of initial versions of some documents to be produced.

6. Conclusions

Our experiences indicate the successful applicability of ISO/IEC 15504 also in SCs aiming at software process improvement. However, we also observed that in order to further reduce effort and to better attend the specific requirements of SCs regarding software process assessment, a more detailed methodological and tool support is required. Therefore, a customized assessment method is currently being developed in the research project 15504MPE adapted to the specific characteristics and needs of SCs based on our experiences and other existing approaches. In the future, further studies are planned to validate the methodology and tool being developed with respect to its impact on the costs and benefits on software process assessments in SCs.

References

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