Chapter XII

Software Maintenance Process Modeling and Analysis

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ABSTRACT
The chapter provides the insight into software maintenance process, its features, actors, activities and results, with the emphasis on the importance and complexity of systems maintenance. The issues related to maintenance modeling, maintenance process evaluation and improvement are addressed. The chapter proposes a method for system maintenance modeling and analysis. Software maintenance process is modeled in terms of queuing network with applied simulation. Method implementation is described by a case study of telecommunication maintenance with the field process data. The case study and the related maintenance activities with data are described in detail. The results of the method application show how the process bottlenecks are formally identified and how new proposals for the improved process design should be analyzed. The chapter emphasizes the importance of a well-defined and balanced process indispensable for efficient maintenance of the large telecommunication software.

INTRODUCTION
As information systems become more complex, software organizations are looking for the solutions that outline the improvement of the software process. Process efficiency is laborious to determine and improve. The analysis of any software process requires that it runs over some time. Since introduction of changes into the running process is very risky and expensive, it is essential to develop a valid process model and to perform
competent model analysis. It is necessary to determine how the existing process responds to the proposed changes and whether the available infrastructure can fulfill the requirements set by the new process proposals.

Despite availability of the generic models for software maintenance, there is an obvious need for some specific modeling and analytical methods for particular software processes that have a certain level of maturity. These methods should be efficient in analyzing both the existing process in the organizational setting and a new or redesigned process in the same organizational setting (Car & Mikac, 2002). The risks and expenses related to the field experiment need to be reduced in any process improvement. The overall process has to be reviewed and the impact of the changed inputs on its outputs and performance must be measured.

As a possible solution to the mentioned problem of software process evaluation, this chapter introduces the method for modeling and analyzing the performances of the software maintenance process. The method is aimed at improving the maintenance process. It is based on the process model in the form of the queuing networks, and it applies discrete simulation to determine process performances. Simulation is an empowered analytical technique, capable of encompassing complex system interactions and time variant behaviors important to capture. This particular method is easy to implement, and uses the existing historical data about maintenance. It can be employed as a special technique within the given generic model, as a part of an organizational effort to upgrade the process maturity and efficiency. Its implementation allows efficient comparison of the alternative process designs without the risk associated with the experiments in the online process. A detailed description of the method can be found in Car (2001).

The method implementation is demonstrated on a case study of software maintenance in a telecommunication company. A graphical presentation of the maintenance case study is shown in Figure 1. The case study is based on the maintenance activities in a large ISO-certified manufacturing telecommunication company with CMM level 3. This particular domain is chosen since it offers great opportunity for practical employment of the method. The presented quantitative and qualitative process data as well as the results of the process analysis are presented to demonstrate the maintenance process in reality, expressing the process performances, and the relations between different process performances.

The objectives of this chapter are:

- Providing insight into a telecommunication software maintenance process, its features, actors, activities and results, with the emphasis on the importance and complexity of this kind of maintenance.
- Presenting how the process actors recognize in practice what the critical points are and how they adopt process definition to reach business goals.
- Showing how the need for process improvement is recognized.
- Revealing complexity and other problems associated with the maintenance process analysis and improvement.
- Providing a detailed description of the particular method for software maintenance process modeling and analysis based on the simulation, and describing the method implementation for the case study of telecommunication maintenance with the field process data.
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