Chapter 36
Impact Assessment of Policies and Practices for Agile Software Process Improvement:
An Approach Using Dynamic Simulation Systems and Six Sigma

George Leal Jamil
InescTec, Portugal

Rodrigo Almeida de Oliveira
IETEC, Brazil

ABSTRACT

This chapter proposes the application of computer simulation models for the evaluation of software quality improvement through the implementation of policies and practices of software development processes and performing the measurement of the evolution of the quality through the Six Sigma methodology. In order to provide decision makers of process improvement, a model of dynamic simulation of systems was proposed. Model validation was performed using data collected from various projects developed in an information technology company headquartered in Belo Horizonte-MG. The models mentioned in this chapter are able to provide the decision makers a tooling of process improvement able to perform predictions, predictions, analysis of "what if" scenarios in the model. As a result of this work, a dynamic simulation model of systems capable of performing the evaluation of software quality in Sigma level is found. Also, there are comparisons and analyses of actual data of software development projects with the simulation data of the models presented. The earnings with the new version of the case exceed by more than 50% the Sigma level, the quality of software developed, and reduction of more than 55% of the time of development of the project.

DOI: 10.4018/978-1-5225-3012-1.ch036

INTRODUCTION

The review aims to deepen the knowledge about the context in which the job is located. To support the research, this work has focused on issues of the following areas: systems dynamics, Six Sigma, process models of Software development, Software defects and quality of Software. The starting point for to understand the context were some the studies like: the dissertation of Tonini (2006), which contains objective and clear explanations as to the operation of Six Sigma, reading the article of Tawileh (2007), containing a simulation model using the practices cited by Chulani and Boehm (1999); the study of the best practices for software engineering, described by Jones (2010); the reading the doctoral thesis on dynamics of agile software development projects made by Glaiel (2012), and other articles related to the topic.

Tawileh (2007) adapted a model, named CoQualMo (*Constructive Quality Model)*, using a systems dynamics approach to evaluate of quality policies presented by Chulani and Boehm (1999). The adapted model was based on the system dynamics model for developing software that was originally proposed by Abdel-Hamid and Madnick (1991), and complemented by Madachy (2007). This model of Madachy (2007) also checks the impact of process improvement in software development actilkikevity, such as, for example, software inspection activities.

Jones (2010.130) offers a list of best practices for improving the quality of software through software test. These good practices presented are also evaluated and supplemented by Collofello *et all* (1998). The results presented by these authors are compared with the results presented by the model of this master's work.

Nasirikaljahi (2012.267) makes a proposal for an evaluation of these policies within the framework of systems dynamics modeling, in order to assess the impact on improving the quality of the software, as well as check if these policies are relevant to the process of continuous improvement of software development.

Glaiel model (2012) proposes a set of agile software development practices, which, when applied in your entirety, increase the quality of developed software. These reported practices serve as the instrument to assess the level of use of agile methodology (AGILEMANIFESTO (2001)) by a particular company or software development team.

However, what has been observed in other models cited in this work, as the models of Madachy (1994), Madachy (1996), (2007), Glaiel Tawileh (2012) and Nasirikaljahi (2012), is that they do not provide a statistical evaluation using the Six Sigma methodology, by Tonini (2006) and Fehlmann and Kranich (2014), and which will be evaluated in this work.

Upon completion of each version of the model, calibrations will be held with data available in the literature, and it is necessary to return to previous steps to adjust parts of the template, fix or adjust relationships and diagrams, include new variables, or adjust the input parameters. This flow will be repeated until the model becomes stable and consistent with the literature. At the end of this step, it will be provided a stabilized model ready to perform the next step, i.e. the simulation of scenarios.

At this stage, will be held a defined set of scenarios for simulation, using systems dynamics models with the reviews cited above. The base model of reference for these simulations will be the model of Madachy (1996) and Tawileh (2007). The simulations use the approach *"*what if*",* which allows assessing different simulation results. In this section will be presented the charts, evaluations of the scenarios and the results of the simulations.