Chapter X

Quality Metrics and Bayesian Analysis: The Case of Extreme Programming

Francisco Macias, Technologic of Monterrey, Mexico

Mike Holcombe, University of Sheffield, UK

Abstract

This chapter presents an empirical assessment of the quality of the process of building software systems in light of the recent emergence of agile development methodologies, which were designed to help with the development of higher quality information systems under given conditions. The purpose of this research was to assess one of these agile approaches, eXtreme Programming (XP), through a comparison with a traditional (design-driven) software construction process. With this aim we observed and measured the work of several student groups using different approaches to produce software for commercial companies during a semester. The data collected were analyzed following the Bayesian approach. Our results indicate that XP could cope with small/medium size projects of software construction delivering a measurable improvement in the quality of the system as judged by the business clients.
Introduction

Quality measurement in software engineering constitutes a broad universe with many actors. Typically, empirical assessments of software construction methodologies are conducted by researchers rather than by software engineering practitioners. Among other reasons, this is so because the assessment process has not been fully defined, the guidelines do not always provide a well structured, smooth, and continuous description of how to do assessments; there are many gaps and a lack of general principles in this discipline, and there is no agreed format for presenting the results of such studies (Kitchenham, 2001). On the other hand, such studies can result in valuable insights, which can create real business value. There is a glaring need for the definition of a proper method to assess the software construction process in order to inform decision-making about appropriate methods for a particular application situation. In this study we assess eXtreme programming (XP) which has attracted much publicity but very little rigorous scientific evaluation for verifying its merits.

XP is one of the methods recently introduced to deal with the challenge of providing quality in software construction processes; it is a radical approach, in which the role of detailed design is reduced significantly (Beck, 1999b). This may create the impression that it is a variant of hacker programming. There is still no consensus on its efficacy; some describe XP as merely “working in pairs”, while others claim that it is the solution to the software crisis. Quite often such opinions are based solely on anecdotal evidence. Beck, the author of XP, presents it as a collection of practices that brings fresh air to the software construction process through the core principle of simplicity. The process (of software construction) is redesigned to avoid, as much as possible, the practices that make it heavy and bureaucratic. Our goal in this chapter is to provide scientifically tested evidence to make a meaningful contribution to this debate by providing empirical information about the strengths, weaknesses, and limits of the applicability of XP.

In this research effort we make two contributions: First we attempt to enlighten the on-going debate through an empirical assessment of XP in order to produce evidence to assist with a proper understanding of its scope and value. Second, we contribute to the definition of an effective methodology for conducting such empirical assessments. In order to run such an assessment, we exploited the opportunity at the University of Sheffield, which has links to industry and real projects for its students and an extensive program of experimentation as part of the Sheffield Software Engineering Observatory (Observatory, 2004), to conduct our experiment. This experiment compares the quality of two software production processes involved in producing traditional, design-led software with XP. This chapter presents the results and findings of the assessment.
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