Chapter IV

The Impact of Software Testing In Small and Medium Settings

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ABSTRACT

In the U.S. alone, the cost of faulty software ranges in the tens of billions of dollars per year; the costs of inadequate testing infrastructure are estimated between $22.2 and $59.5 billion, one half paid by the developers and the other half by the users. Albeit the criticality of a good testing process (the inadequacy of which would kill many small enterprises, in particular Latin American ones), many times the testing process is misapplied or not applied at all. We provide here some foundations of the discipline of software testing and present fragments of a variation of a test process used successfully by e-Quallity Corporation (a firm specialized in software testing) in commercial projects, defined formally using a small proprietary process definition language. We present also two case studies of projects with Mexican small and medium enterprises showing concrete economic impacts of the use (and misuse) of this testing process.

INTRODUCTION

It is estimated that the costs (in the industry) of faulty software in the U.S. range in the tens of billions of dollars per year, representing approximately just under 1% of the gross domestic product (Tassey, 2002). Although testing is an activity that could help reduce this significantly, it is frequently considered a cost-only activity. As a result, there is a tendency in software organizations to reduce it to the minimum, sometimes treating it as a second-class activity. Consequences from this tendency can be seen, for example, in organizations that have testing teams composed of people who “have not done it elsewhere”; people who do not have the appropriate qualifications to be testers and are not being properly trained to develop tests; or testing groups that are wrongly positioned in the organization chart, typically under the project manager who is in turn under the product manager who is in turn under the chief information officer (CIO). Such a configuration
easily generates the situation of unheard or misunderstood test results by the CIO and the CEO (chief executive officer) and a lack of authority of the testing team in the decision of accepting or rejecting a product. Usually the testing teams in these organizations receive the system under testing at the end of the development cycle, frequently with only a few days (and nights!) left for testing before the release date. In such a situation, the testing team will always be wrong: if it accepts testing at the end with little time, it will probably miss catching many bugs, so it will be said that “the testing team did not do its job correctly”; if it does not accept the time constraint and demands the authority to approve or reject the product, then it will be said that “the release was delayed because of the testing team.” We believe that this view of testing is mainly due to a lack of understanding of its cost-benefit relation within the software development process and to an underestimation of its complexity and impact.

In this chapter, we present foundations and economics of software testing, as well as fragments of a formally defined test process used successfully in commercial projects, together with two real case studies showing concrete economic impacts that the use (and misuse) of this process had in projects with two Mexican small- and medium-sized enterprises (SMEs). The process was applied in these two projects by e-Quallity Corporation² (referred to as “e-Quality” from here on), a firm specialized in software testing. We start this chapter by setting up a conceptual framework; we then present the testing process and develop the case studies. Finally, we reveal some conclusions.

THE PROBLEM AND SOME SOLUTIONS PROPOSED

We will present here the problems justifying the discipline of software testing and other related approaches; we then propose a definition and describe some concepts involved in it, providing the point from which we view and analyze the case studies developed in this chapter. Finally, we present data concerning the relative cost of software testing, which will be important in later sections.

A “Software Crisis”

There is a debate in the literature between authors stating that there has been a decades-long chronic crisis in the software industry (e.g., Scientific American, 1994), and some say that such a crisis has already been overcome. One can agree with one or another viewpoint, but one can easily perceive that in this industry:

- We have an ever-growing number of application areas.
- Software systems become bigger and more complex.
- There is a growing demand for quality in software products.

Regarding the last problem, some approaches to reduce the problem have been developed besides testing, for example:

- Quality models such as the Capability Maturity Model Integration (CMMI)³ (Charris, 2006) and MoProSoft (Ventura-Miranda & Peñaloza-Báez, 2006) with the underlying idea that high-quality processes will generate high-quality products.
- Quality “philosophies” such as total quality management for software (TQMS) (Schulmeyer, 1993), which emphasizes the role of qualified and motivated people in the development of high-quality software.
- Formal methods (Gabbar, 2006) with an emphasis in the (full) automation of software development by means of formal languages (in the sense of Rozenberg & Salomaa, 1997) to obtain “bug-free software.”
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