An Approach for Evaluating and Improving the Test Processes of Mobile Application Developments

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Abstract

Mobile applications have become highly pervasive in recent years. Assuring the quality of mobile applications is a highly relevant issue since application failures can lead to serious consequences, such as damage of corporate reputation or financial loss. Several obstacles exist in testing mobile applications (e.g., lack of time, absence of methods, limited budget). Our goal in this work is to investigate how we can enhance the effectiveness of testing processes applied by companies developing mobile applications. To do so, it is necessary to identify where applied industrial testing processes are actually missing in order to provide countermeasures. Our approach comprises a set of previously selected mobile testing requirements, which enable the investigation and rating of the applied testing processes based on the fulfillment of these requirements. Elicitation is done via a systematic interview of a company based on a defined questionnaire. Identified failures of selected mobile application projects are then related to the set of mobile testing requirements, and the severity of unfulfilled testing requirements is determined. Finally, we recommend to this company a set of countermeasures for unfulfilled testing requirements that may lead to crucial failures. We evaluated this approach by applying it together with eight software companies in Germany and in Brazil, followed by two surveys: one right after the interview to evaluate the acceptance of the approach, and another one after the post-processing and recommendations phase. The evaluation showed the acceptance of our approach and the expected enhancement of the effectiveness of the companies' mobile testing processes.

Keywords: Mobile applications, Testing, Process improvement, Requirements, Industrial study.

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1. Introduction

Society is experiencing a ubiquitous and permanently connected lifestyle. In this scenario, moving business into the mobile paradigm is the next big wave of computing and a matter of survival for most organizations[1]. Due to the intrinsic characteristics of mobile applications (e.g., several sensors monitoring users and their environment, mobility, connectivity), assuring the quality of these applications is crucial, since failures are not likely to go unnoticed by consumers and can damage a corporate reputation and cause financial loss.

Assuring the quality of mobile applications requires effective testing during development, including additional tests particular to the mobile world. An example of a company's mobile development project: A mobile application that offers route guidance and is dependent on GPS requires the location services of the device; the deactivation of the location services during the use of the application leads to a crash of the application. This issue can be revealed by a test case as stated in the following. Precondition: Start route guidance in the orientation support view. Action: Change to settings menu of the operating system and deactivate location services. Post-condition: Route guidance handles the missing availability of route guidance. In this sense, mobile application development companies have to adjust their testing processes. However, several obstacles[2] are perceived in testing mobile applications, such as lack of time, absence of adequate processes or methods, and limited budgets. This calls for a lightweight evaluation and improvement approach for the testing processes of mobile application projects. Such an approach is intended to diminish the gap between industry practices and the state-of-the-art proposals for the quality assurance of mobile applications. Thus, in this research our goal is to support the enhancement of testing processes applied by companies developing mobile applications. This leads to the following research questions:

- RQ1: What are the requirements for a testing process in the context of mobile application development?
- RQ2: How to elicit the fulfillment of mobile-specific testing requirements and their relations to failures that have occurred in a mobile development project?
- RQ3: How to use the information elicited in a mobile development project for improving its testing process?

In this paper, we define a lightweight approach to support the improvement of testing processes in mobile application development companies. This approach is composed of:

1) a systematic interview with project managers or testers of a company, based on a questionnaire using a set of previously selected mobile testing requirements;
2) the investigation and rating of the applied testing processes in that company and mobile application failures that have occurred in a recent project to elicit the fulfillment of the previously defined mobile testing requirements;
3) the analysis of common identified failures and the determination of the severity of unfulfilled testing requirements in order to recommend countermeasures regarding failures that are due to these testing requirements.

To evaluate the proposed approach, we applied it together with eight mobile application development companies in Brazil and in Germany, and elicited common failures from each company's internal projects. Furthermore, we surveyed these companies right after the interviews and once more after post-processing and providing the recommendations. Overall, the evaluation showed distinct acceptance of our approach to enhance the effectiveness of a mobile testing process.

The remainder of this paper is organized as follows: Section 2 describes related work for test process improvement, Section 3 outlines our proposed approach, and Section 4 discusses the study we performed and its results. Finally, Section 5 presents our conclusions and directions for future work.

2. Improving the Testing of Mobile Applications

This section presents established models for general test process improvement and discusses the identified approaches that explicitly consider mobile testing requirements as part of mobile application development.