Abstract

Background: Software quality assurance (QA) is an essential activity in the software development lifecycle. Among the different QA activities, regression testing is a challenging task for large-scale software development. Regression testing is a well-researched area, and a large number of techniques have been proposed to fulfill the needs of industry. Despite the extensive research, the adoption of proposed regression testing techniques in the industry is limited. Studies show that there is a visible gap between research and practice.

Objective: This work aims at reducing the gap between industry and academia in regression testing. To fulfill this aim we have the following objectives:

1) Understanding the practitioners' goals regarding regression testing.
2) Understanding the current state of regression testing practice and challenges in the industry.
3) Investigating the testing research applicable in an industrial context.

Method: We conducted multiple studies using different methods.

To explore the industry perspective on regression testing we used focus group and interview-based studies. To explore solutions from the literature, we used the systematic literature review and systematic mapping study.

Results: This thesis presents the practitioners' specific regression testing goals. The identified goals are confidence, controlled fault slippage, effectiveness, efficiency, and customer satisfaction. The challenges identified in the thesis are of two categories, 1) management related challenges and 2) technical challenges. Technical challenges relate to test suite maintenance, test case selection, test case prioritization, evaluation of regression testing.

We have mapped 26 empirically evaluated regression testing techniques to the context, effect, and information taxonomies, and provided a guide to the practitioners regarding the adoption of the techniques in an industrial setting. We have also classified 56 model-based test case generation techniques regarding their strengths/limitations, input/intermediate models used, and relevance to the industrial context.

Conclusions: The challenges identified in this study are not new for research and practice. There could be two reasons regarding the presence of recurring challenges: 1) regression testing techniques proposed in the literature do not fit the companies’ context, 2) or, companies are not aware of the availability of the techniques that could be suitable for their context. To support the adoption of existing research on regression testing in the industry, we have presented three taxonomies. These taxonomies, allow the characterization of regression testing techniques and enable to determine which of these techniques might be suitable in a given context. Furthermore, the identification of information needs for these techniques would be helpful to learn the implications regarding the cost of adoption. Regarding the support in test case generation, we conclude that current research on interaction model-based test case generation techniques did not illustrate the use of rigorous methodology, and currently, model-based test case generation techniques have low relevance for the industrial problems.