Structuring Exploratory Testing through Test Charter Design and Decision Support
Ahmad Nauman Ghazis (Blekinge Institute of Technology)

Exploratory testing (ET) is an approach to test software with a strong focus on personal skills and freedom of the tester. ET emphasises the simultaneous design and execution of tests with minimal test documentation. Test practitioners often claim that their choice to use ET as an important alternative to scripted testing is based on several benefits ET exhibits over the scripted testing. However, these claims lack empirical evidence as there is little research done in this area. Moreover, ET is usually considered an ad-hoc way of doing testing as everyone does it differently. There have been some attempts in past to provide structure to ET. Session-based test management (SBTM) is an approach that attempts to provide some structure to ET and gives some basic guidelines to structuring the test sessions. However, these guidelines are still very abstract and are very open to individuals' interpretation.

The main objective of this doctoral thesis is to support practitioners in their decisions about choosing exploratory versus scripted testing. Furthermore, it is also aimed to investigate the empirical evidence in support of ET and find ways to structure ET and classify different levels of exploration that drive the choices made by exploratory testers. Another objective of this thesis is to provide a decision support system to select levels of exploration in the overall test process.

The findings presented in this thesis are obtained through a controlled experiment with participants from industry and academia, exploratory surveys, literature review, interviews and focus groups conducted at different companies including Ericsson AB, Sony Mobile Communications, Axis Communications AB and Softhouse Consulting Baltic AB.

Using the exploratory survey, we found three test techniques to be most relevant in the context of testing large-scale software systems. The most frequently used technique mentioned by the practitioners is ET which is not a much researched topic. We also found many interesting claims about ET in grey literature produced by practitioners in the form of informal presentations and blogs but these claims lacked any empirical evidence. Therefore, a controlled experiment was conducted with students and industry practitioners to compare ET with scripted testing. The experiment results show that ET detects significantly more critical defects compared to scripted testing and is more time efficient. However, ET has its own limitations and there is not a single way to use it for testing. In order to provide structure to ET, we conducted a study where we proposed checklists to support test charter design in ET. Furthermore, two more industrial focus group studies at four companies were conducted that resulted in a taxonomy of exploration levels in ET and a decision support method for selecting exploration levels in ET. Lastly, we investigated different problems that researchers face when conducting surveys in software engineering and have presented mitigation strategies for these problems.

The taxonomy for levels of exploration in ET, proposed in this thesis, provided test practitioners at the companies a better understanding of the underlying concepts of ET and a way to structure their test charters. A number of influence factors elicited as part of this thesis also help them prioritise which level of exploration suits testing more in their product's context. Furthermore, the decision support method provided the practitioners to reconsider their current test focus to test their products in a more effective way.