Understanding the influence of human factors on testing activities in software producing organizations

Doctoral Thesis presentation

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26 November 2015
Trondheim, Norway
Aknowledgements

- Main supervisor & co-supervisors
- Members of the comitee
- Colleagues and staff from IDI
- Colleagues from work
- Participant companies
- Friends & family
Intro

• We live surrounded by software based products which we use every day

• Software testing is the main process used for ensuring the high quality of a product
Why do we need testing?

• Our dependency on software makes us vulnerable to software malfunctions

• Infamous bug: Ariane 5
  – Ariane 5 rocket, Flight 501, 1996
  – Failed 37 seconds after launch
  – Cost US$370 million

Software malfunction!
Software and humans

• An activity that requires a lot of human labor
  – Despite a wide range of available tools.

• It is highly dependent on the performance of the involved employees

• Motivation is one of the most frequently cited causes for failure in software development projects

• Improving software testing should be seen as a socio-technical challenge
Studies of testing

- Extensive literature on software testing practices is available, but it tends to focus on methods, techniques and tools

- Social aspects of testing need to be taken into consideration when studying testing work

- This work focuses on the people performing the testing
Research objectives

- Develop knowledge on how testers are organized in their companies
- Explore how they can be motivated in their work and what are influence them in their daily activities
- Understand when the perceptions of software testing are formed and how they evolve during the educational and professional years
Research questions

• **RQ1** What contextual factors are salient in situations that can generate strong motivation for software testers?

• **RQ2** How is the motivation of software testers encouraged in practice?

• **RQ3** How does working experience in industry contribute to the perception of testing activities' importance?
Research Methods

• Surveys with multiple choices or open questions were used for the initial phase

• Interviews with professional testers, testing managers, project managers and developers were adopted in the subsequent phases

• Restrictions based on the internal policies of the participating companies
Research evolution

RQ1
Empirical study on Organization of Software Testing Activities in Norwegian Software Companies

RQ3
Empirical study on Factors Influencing the Choice of a Career and view of Testing among Norwegian Students

RQ1
Motivational factors and characteristics of software testers – Phase 1

RQ3
Analyzing the survey importance of teaching about testing

RQ2
Motivational factors and characteristics of software testers – Phase 2

2010 April

Quantitative study

Qualitative study

Paper

Research question

2015 July

Input
List of publications

- P1 Deak, A., Stålhane, T. "Organization of Testing Activities in Norwegian Software Companies", 2013 IEEE Sixth International Conference on Software Testing,

- P2 Deak, A., Stålhane, T., Cruzes, D., "Factors Influencing the Choice of a Career in Software Testing among Norwegian Students", IASTED SE, 2013:

- P3 Deak, A., Sindre, G. "Analyzing the importance of teaching about testing from alumni survey data" NIK Norsk Informatikkonferanse 2013


- P6 Deak, A., Stålhane, T., Sindre G., "Challenges and strategies for motivating software testing personnel" Accepted at Information and Software Technology journal
# Contributions

<table>
<thead>
<tr>
<th>ID</th>
<th>Contribution</th>
<th>Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1.</td>
<td>Identification of challenges encountered by testers, managers and developers during software testing activities</td>
<td>(P1, P4, P5, P6)</td>
</tr>
<tr>
<td>C2.</td>
<td>A classification framework for organizing and managing testing personnel</td>
<td>(P1, P4)</td>
</tr>
<tr>
<td>C3.</td>
<td>A description of factors that motivate software testing personnel and strategies deployed by the companies for stimulating their testers. We identified new motivational and de-motivational factors within the testing context</td>
<td>(P1, P5, P6)</td>
</tr>
<tr>
<td>C4.</td>
<td>A set of characteristics and skills considered suitable or desirable when hiring software testers</td>
<td>(P1, P4)</td>
</tr>
<tr>
<td>C5.</td>
<td>A multi-faceted perspective of the perception of a testing career among students and graduates and factors influencing the students in pursuing a software testing career</td>
<td>(P2, P3)</td>
</tr>
</tbody>
</table>
C1. Challenges encountered by testers, managers and developers during software testing activities (1)

- **Lack of influence and recognition**
  - late involvement in the project
  - testing is underestimated in the company

- **Friction with higher management**
  - insufficient resources,
  - unrelated tasks

- **Insufficient testware**
C1. Challenges encountered by testers, managers and developers during software testing activities (2)

- **Time pressure**
  - testing time is lost due to development delays
  - stringent especially in traditional projects

- **Conflicts with developers**
  - bugs related discussion
  - frictions due to validity, severity
C2. A classification framework for organizing and managing testing personnel

- low preference for having a separate testing department or a dedicated testing staff
- none of the participant companies were outsourcing testing activities
  - companies prefer to have remote testing teams

<table>
<thead>
<tr>
<th>Organizational categories</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testers divided among the application groups</td>
<td>42%</td>
</tr>
<tr>
<td>Developers responsible for all the testing activities with no formal testing staff in the company.</td>
<td>26%</td>
</tr>
<tr>
<td>A dedicated software testing department</td>
<td>21%</td>
</tr>
<tr>
<td>Combination of testing department and testers divided among application groups.</td>
<td>11%</td>
</tr>
</tbody>
</table>
C3. Factors and strategies that motivate software testing personnel (1)

- Enjoy challenges

- Focus on improving the quality
  (S) - Buffer period was allocated for testing

- Variety of work
  (S) - Rotation between products/projects

(S) = strategy
C3. Factors and strategies that motivate software testing personnel (2)

• Recognition
  (S) - Including testers in the daily communication with the customers

• Good relationships with colleagues
  (S) - Open space/collocating the teams
  (S) - Setting common goals for testers and developers
A set of characteristics and skills considered most desirable for software testers

<table>
<thead>
<tr>
<th>Most wanted tester characteristics</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>7</td>
</tr>
<tr>
<td>IT background</td>
<td>6</td>
</tr>
<tr>
<td>Need for variety</td>
<td>6</td>
</tr>
<tr>
<td>Details oriented</td>
<td>5</td>
</tr>
<tr>
<td>Curious</td>
<td>4</td>
</tr>
<tr>
<td>Focus on quality</td>
<td>4</td>
</tr>
<tr>
<td>Patient</td>
<td>4</td>
</tr>
<tr>
<td>Testing experience</td>
<td>4</td>
</tr>
</tbody>
</table>
C5. View of Testing through the time

- Bachelor and master level students view of testing

<table>
<thead>
<tr>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interesting (TDD)</td>
<td>Boring</td>
</tr>
<tr>
<td>Experience</td>
<td>Rather writing code</td>
</tr>
<tr>
<td>??</td>
<td>Not creative</td>
</tr>
<tr>
<td></td>
<td>Low status</td>
</tr>
<tr>
<td></td>
<td>Unrewarding</td>
</tr>
</tbody>
</table>

- Graduates view of testing

We wish we’ve learned more about testing!
Observations

• **concept of software tester** is not as consistently defined and cemented as the one of developer

• discrepancies found between the expressed goals and the concrete implementation
  - resources required to run testing activities
  - testing knowledge vs development knowledge at hiring

• negative experience with testing outsourcing
Future work

- Extend the qualitative and quantitative survey to a higher number of participants, even internationally.
- A longitudinal study may provide further insights into the motivational and de-motivational factors of software testing personnel.
- Use action research in selected companies with an expressed need to improve testers motivation, evaluate a reselected strategy.
Thank you!

Q&A
Correlations between research questions, contributions and papers

<table>
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<td>C3, C4</td>
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<tr>
<td>RQ3</td>
<td>C2, C5</td>
<td>P2, P3</td>
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