

Report on the 8th International Workshop on Quantitative Approaches to Software Quality (QuASoQ 2020)

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1. Introduction

After a successful 7th QuASoQ workshop we slightly adjusted the list of topics for the workshop. The topics of interest included

- New approaches to measurement, evaluation, comparison and improvement of software quality
- Application of metrics and quantitative approaches in agile projects
- Case studies and industrial experience reports on successful or failed application of quantitative approaches to software quality
- Tools, infrastructure and environments supporting quantitative approaches
- Empirical studies, evaluation and comparison of measurement techniques and models
- Quantitative approaches to test process improvement, test strategies or testability
- Empirical evaluations or comparisons of testing techniques in industrial settings

Overall, the workshop aimed at gathering together researchers and practitioners to discuss experiences in the application of state of the art approaches to measure, assess and evaluate the quality of both software systems as well as software development processes in general and software test processes in particular.

As software development organizations are always forced to develop software in the "right" quality, the

quality specification and quality assurance are crucial. Although there are lots of approaches to deal with quantitative quality aspects, it is still challenging to choose a suitable set of techniques that best fit to the specific project and organizational constraints.

Even though approaches, methods, and techniques are known for quite some time now, little effort has been spent on the exchange on the real-world problems with quantitative approaches. For example, only limited research has been devoted to empirically evaluate risks, efficiency or limitations of different testing techniques in industrial settings.

Hence, one main goal of the workshop was to exchange experience, present new promising approaches and to discuss how to set up, organize, and maintain quantitative approaches to software quality.

2. Workshop History

The QuASoQ workshop series has been started in 2013. Since then, the workshop is always organized as a collocated event of the Asia-Pacific Software Engineering Conference (APSEC).

These are the past workshop editions:

- **7th QuASoQ 2019**
Putrayaya, Malaysia | CEUR Vol-2511
- **6th QuASoQ 2018**
Nara, Japan | CEUR Vol-2273
- **5th QuASoQ 2017**
Nanjing, China | CEUR Vol-2017
- **4th QuASoQ 2016**
Hamilton, New Zealand | CEUR Vol-1771
- **3rd QuASoQ 2015**
New Delhi, India | CEUR Vol-1519
- **2nd QuASoQ 2014**
Jeju, Korea | IEEE Xplore
- **1st QuASoQ 2013**
Bangkok, Thailand | IEEE Xplore

Since the first edition 58 papers have been presented; the average acceptance rate is 76 %. The following chart depicts where the authors of accepted papers come from.

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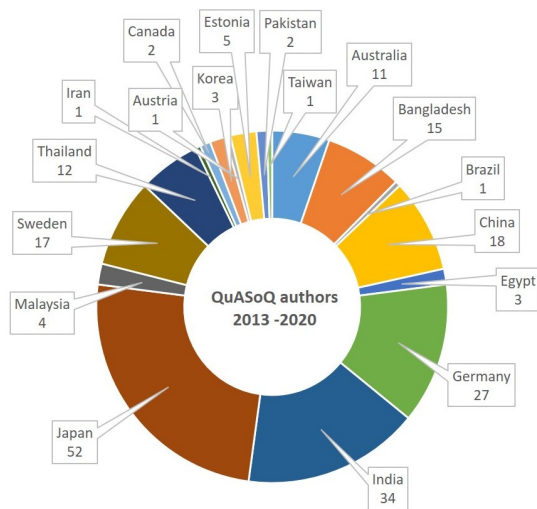


Figure 1: Origin of QuASoQ authors

3. Workshop Format

Because of the covid-19 pandemic, the workshop was executed digitally using the video conferencing tool Zoom.

Based on our former experience the workshop to be highly interactive. In order to have an interesting and interactive event sharing lots of experience, we organized the workshop presentations applying the **author-discussant model**.

Based on this workshop model, papers are presented by one of the authors. After the presentation, a discussant starts the discussion based on his or her pre-formulated questions. Therefore, the discussant had to prepare a set of questions and had to know the details of the presented paper. The general structure of each talk was as follows:

- The author of a paper presented the paper (15 minutes).
- After that, the discussant of the paper opened the discussion using his or her questions. Finally, we moderated the discussion among the whole audience (5 minutes).

The presentations were divided into four sessions with a ten minute break inbetween. Each session was accompanied by a moderator who tried to ensure that the schedule was kept to. A particular challenge were the different time zones of the participants. We decided to hold the workshop in the afternoon of the timezone in Singapore, so that presenters don't have to attend at nighttime. The order of presenters were also determined by their respective timezone.

4. Workshop Contributions

Altogether 12 papers were submitted. Finally, the following 10 papers were accepted by the program committee for presentation and publication covering very different topics.

- Sousuke Amasaki
Augmenting Window Contents with Transfer Learning for Effort Estimation
- Syed Fatiul Huq, Md. Aquib Azmain, Nadia Nahar and Md. Nurul Ahad Tawhid
On the Evolutionary Properties of Fix Inducing Changes
- Alejandra Duque-Torres, Dietmar Pfahl, Anastasiia Shalygina and Rudolf Ramler
Using Rule Mining for Automatic Test Oracle Generation
- Konrad Fögen and Horst Lichter
An Industrial Case Study on Fault Detection Effectiveness of Combinatorial Robustness Testing
- Azeem Ahmad, Ola Liefler and Kristian Sandhal
An Evaluation of Machine Learning Methods for Predicting Flaky Tests
- Barry-Detlef Lehmann, Peter Alexander, Horst Lichter and Simon Hacks
Towards the Identification of Process Anti-Patterns in Enterprise Architecture Models
- Benyamin Shafabakhsh, Robert Lagerström and Simon Hacks
Evaluating the Impact of Inter Process Communication in Microservice Architectures
- Toukir Ahammed, Moumita Asad and Kazi Sakib
Understanding the Involvement of Developers in Missing Link Community Smell: An exploratory Study on Apache Projects
- Hina Anwar, Iffat Fatima, Dietmar Pfahl and Usman Qamar
Detection and Correction of Android-specific Code Smells and Energy Bugs: An Android Lint Extension
- Kristiina Rahkema and Dietmar Pfahl
Comparison of Code Smells in iOS and Android Applications

5. Summary of the Discussions

About 20 researchers attended the workshop and participated in the discussions. The author-discussant model was well received by the participants and led to intensive discussions among them. Hereby, other participants, apart from the discussant, also joined the resulting discussions.

Some papers conducted machine learning experiments, which lead to discussions about possible biases of the applied machine learning model. An example for this was

the discussion of the paper by Ahmad et al. where predictions of test-flakiness were made based on the number of times a keyword appears in a test-case. A participant suggested, that other kinds of frequencies, like tf-idf could be considered. Since this was an experimental study, the authors plan to investigate more into the features and consider weighting them. Besides that, a participant pointed out that the predictions may be biased due to imbalanced classes, since the number of flaky tests used in training is less than the number of non-flaky tests.

Furthermore, many proposed methods or approaches offer potential for further research. The paper by Huq et al., for example, only considers commits in GitHub repositories in order to analyze the evolution of fix-inducing changes. Different participants were also interested in the effect of including bug repositories and differentiating between major and minor releases. The authors assume that this would lead to different results.

The paper by Shafabakhsh et. al. lead to a similar discussion. In their evaluation of the impact of inter process communication in microservices, they focus on maintainability and availability. Other participants mentioned to also consider other attributes, like security or the development effort that comes with implementing a certain IPC method. Especially the second factor may have an impact on the maintainability of the application. However, this impact has not been quantified yet.

Finally, some presented methods were discussed by participants regarding their usefulness in practice. As a result, the approaches presented by Duque-Torres et. al. and Ahmad et. al. could be used to improve fault detection and localization. On the other hand, the android smell and bug detector and corrector by Anwar et. al. has potential to become an extension of the existing and widely used tool Android Lint.

The discussions show, that empirical studies and the results of experiments are of high value and lead to a deeper understanding of the subject that has been investigated.

To conclude, in the course of this workshop the participants proposed and discussed different approaches to quantify relevant aspects of software development. Especially the discussions led to new ideas, insights, and take-aways for all participants.

6. Acknowledgments

Many people contributed to the success of this workshop. First, we want to give thanks to the authors and presenters of the accepted papers. Furthermore, we want to express our gratitude to the APSEC 2020 organizers; they did a perfect job and gave us the freedom to conduct the workshop virtually based on our experience.

Finally, we are glad that these people served on the

program committee (some of them for many years) and supported the workshop by soliciting papers and by writing peer reviews:

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