Report on the 9th International Workshop on Quantitative Approaches to Software Quality (QuASoQ 2021)

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1. Introduction

After a successful 8th 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 approach-es 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
- Mining software repositories

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:

- **8th QuASoQ 2020**
  Singapore | CEUR Vol-2767
- **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**
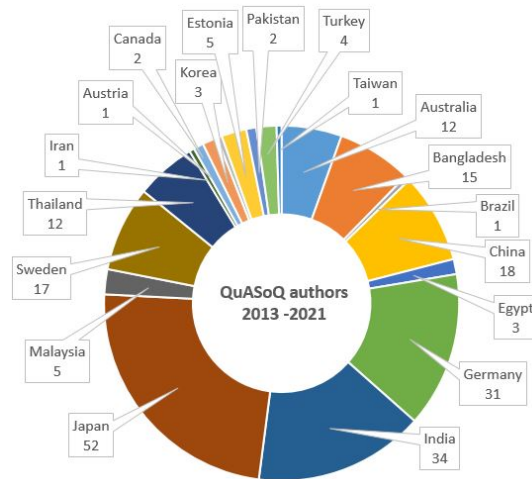 Bangkok, Thailand | IEEE Xplore

Figure 1: Origin of QuASoQ authors

Since the first edition 62 papers have been presented; the average acceptance rate is 75 %. The chart shown in figure 1 depicts where the authors of accepted papers come from.

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 we wanted 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 (20 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 (10 minutes).

The presentations were divided into two sessions with a ten minute break in-between. 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

Taipei, so that presenters don't have to attend at night-time. The order of presenters were also determined by their respective timezone.

4. Workshop Contributions

Altogether 6 papers were submitted. Finally, the following 4 papers were accepted by the program committee for presentation and publication covering very different topics.

- Ruhaya Ab. Aziz
  The impact of Requirements Relationships knowledge on Requirements Quality and Software Development Project success
- Anıl Holat and Ayse Tosun
  Predicting Requirements Volatility: An Industry Case Study
- Lukas Liss, Henrik Kämmerling, Peter Alexander and Horst Lichter
  Towards a Catalog of Refactoring Solutions for Enterprise Architecture Smells
- Derya Yeliz Ulutaş and Ayşe Tosun
  A Condition Coverage-Based Black Hole Inspired Meta-Heuristic for Test Data Generation

5. Summary of the Discussions

About 10 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.

The first discussion was on the paper by Ab Aziz on requirements relationship knowledge (RRK). Participants were particularly interested in the value of this knowledge in agile project management approaches compared to more sequential ones. In addition, methods for assessing the current understanding of RRK in a software development team were explored.

The paper by Holat et. al. lead to a discussion of how their approach of predicting highly volatile requirements can be integrated into the software development process. The presenter of the paper explained that the approach can be applied both in the early phase of a project and after it is completed. Especially in the early phase the predicted volatility can be translated into additional story points for the corresponding issue. After doing this, more experienced developers/reviewer can be assigned to issues which refer to highly volatile requirements.

In the discussion of the paper by Liss et al. it became clear that the authors have a particular interest in future collaboration in their research area. Not only have they

made the resulting catalog available as a public repository that allows merge requests, but they also explain how to contribute. One participant was interested in the differences between code and EA refactoring. Here, the presenter explained that the goals are fundamentally different. While code refactoring focuses on the technical level to improve e.g. maintainability or readability, EA refactoring affects major entities in the IT landscape to improve efficiency of the business.

Finally, the paper by Ulutaş et al. led to a discussion of existing approaches, particularly combinatorial testing, and how they might compare with the approach presented. The author suggested that perhaps a study could be conducted to evaluate whether a combination with combinatorial testing approaches is more effective.

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