

Test automation maturity assessment

Yuqing Wang
M3S Research Unit
University of Oulu, Finland
yuqing.wang@oulu.fi

Abstract—Test automation is becoming critical in software development process. Though it has been widely applied, many are not surprised to find there is the long journey to a mature test automation process. To get continues improvement and achieve or sustain test automation benefits, organizations need to assess the current maturity level of test automation in order to identify improvement steps. However, the contemporary test maturity models are likely to emphasize more on general test process but fewer details for test automation process, and also lack empirical evidence from the industry to validate the statements that indicate maturity levels. To address the above issues, this study aims to examine what should be considered and how to assess the maturity level of test automation.

Keywords—test automation; test maturity; measurement instrument ; assessment

I. INTRODUCTION

Software development teams test their products in order to produce high quality products and meet client's requirements better. When products is becoming more complicated and need to be developed in more agile development process, tedious and labor-intensive manual tests gradually cannot meet the all expectations [1]. To increase test efficiency, test coverage, and test effectiveness, organizations start to automate tests [4]. Automated tests can be run repeatedly with comparably lower costs and faster speed, and currently is becoming the critical in more agile software development process [2].

Though test automation has been widely applied, many are not surprised to find there is still a long journey to a mature test automation process. To get continues improvement and achieve or sustain test automation benefits, organizations need to measure the current maturity level of test automation in order to identify controllable improvement steps. Researchers have developed many test maturity models, such as Test maturity model (TMM) and Test Maturity Model integration (TMMI). However, despite there is an increasing focus on test maturity, the inadequate attention to test automation maturity seems to be the norm in many studies [5]. The exiting test maturity models are likely to emphasize more on general test process but fewer details for test automation process, and also lack empirical evidence from the industry to validate the statements that indicate maturity levels. Furthermore, few formal measurement instruments provided to assess the maturity level of test automation and identify improvement steps.

To address the above issues, the objectives of our research were defined. Firstly, we intend to investigate what aspects should be examined, when assess the maturity level of test

automation. Secondly, we intend to design and develop a formal instrument, which can be used to assess the maturity level of test automation from the different aspects to identify improvement steps. Thirdly, we intend to complement the existing test maturity studies with empirical knowledge and experience from the industry for test automation research.

II. RELATED WORKS

This research is the part of Testomat project, which intends to propose a Test Automation Improvement Model (TAIM). According to the previous study [2], TAIM defines ten key improvement areas (KIAs) for test automation: Test Management, Test Requirements, Test Specifications, Test code, Test Automation process, Test execution, Test Verdicts, Measurements, Test Environment, and Test Tools. Each KIA defines the measurements for the stepwise improvement.

III. METHODOFOLOGY

The research process was designed in accordance with the defined objectives, and consists of three stages: the reviewing, the designing, and the piloting stages. In the first stage, we plan to review the contemporary test maturity and test process improvement models, in order to derive the indicators that are able to indicating the maturity levels of test automation. In the second stage, we plan to design a survey as the measurement instrument to assess the maturity level of test automation, according to the identified indicators. In the third stage, we plan to pilot the designed survey in the different phases of Testomat project. This means running survey several times to help organizations in the project to assess and optimize the test automation process.

IV. CURRENT STAGE AND EARLY RESULTS

The reviewing stage was completed. We reviewed 42 contemporary test maturity and test process improvement models. Garousi et al. [3] have done the multivocal literature review to identify the exiting test maturity and test process improvement models. By using the identified models form their study as the base, we sort the models further against to our inclusion and exclusion criteria. The inclusion criteria is applied, when the models have relevant statements indicating test automation maturity and were developed during 2005 and 2014. The exclusion criteria applied, when the models not related to test automation or were developed before 2005. This has resulted in 21 models left for further reading. We used NVivo to code the statements that indicating test automation

maturity in those models. The indicators of test automation maturity were derived and then categorized by KIAs of TAIM.

Several indicators were identified in each KIA of TAIM. Table I presents two example indicators identified in Test Management KIA, and the detailed contents are also described. For instance, as for the indicator “extent of planning for the whole test automation process”, it examines whether the planning defines ‘the reasons for test automation’, ‘the goals for test automation’, and other contents. As for the indicator ‘the availability of resources assigned to test automation’, it investigates the availability of resources such as skilled people, time & efforts, test tools, and others assigned for test automation.

TABLE I. POTENTIAL INDICATORS OF TEST AUTOMATION MATURITY

Potential indicators	The contents
Extent of planning for the whole test automation process	<p>The reasons for test automation</p> <p>The goals for test automation</p> <p>Product risks analysis</p> <p>Test automation strategy</p> <p>The scope of the methods</p> <p>Test efforts estimation</p>
The availability of resources assigned to test automation	<p>Skilled people</p> <p>Time & efforts</p> <p>Physical facilities</p> <p>Test tools</p> <p>Test data/test environment</p> <p>Hardware</p>

We have sent the results of the reviewing to experts with academic or industry background, and currently are waiting for their comments and feedbacks. The purpose is to validate the identified indicators and also probably found new ones.

V. FUTURE PLANS AND EXPECTATIONS

This chapter presents our ideas to plan future works. However, the detailed designing approaches and methods still need further studies to decide.

A. Designing a survey

We plan to design a survey based on identified indicators, and structure the whole like a “tree”. This means survey questions will be more precise with the maturity level increase. There is an example to assess “extent of planning for the whole

test automation process” of organizations. In the first level, the question is “do you make the planning for test automation process?” If respondents confirm that, it comes to the second level, which examines what they actually plan in test automation process. The instance question is “do you initiate the reasons for test automation?” If respondents confirm this again, it comes to third level that investigates “what reasons they actually initiate”. Respondents can use subjective rating scales to describe their actual situations. For example, they can use 5-point scales to indicate they “strongly disagree”, “disagree”, “neither disagree or agree”, “agree”, or “strongly agree” for each question. The answers of respondents in each level may provide the reference to assess the maturity level of test automation. Concrete methods and approaches will come out later.

B. Piloting

In piloting stage, we plan to run our survey in the industry, to examine if this could really help organizations to assess the current maturity level of test automation for improvement steps. In addition to the goal of constructing TAIM, Testomat project also aims to provide organization with test automation solutions towards the advanced levels of maturity. We expect our survey could be used as a measurement instrument to assess the maturity level of test automation for organizations in the project before and after applying Testomat solutions. The results of this stage can extend to studies, for example, identifying the common challenges to advanced maturity levels in test automation process, or analyzing the current situation of test automation applied in the most of organizations.

ACKNOWLEDGMENT

I would like to thank my supervisor Mika Mäntylä and also Testomat consortiums for their support and help in my research.

REFERENCES

- [1] T. Koomen, B. Broekman, L. van der Aalst and M. Vroon, TMap next: for result-driven testing, Uitgeverij kleine Uil, 2013,.
- [2] S. Eldh, K. Andersson, A. Ermedahl and K. Wiklund, "Towards a test automation improvement model (TAIM)," in Software Testing, Verification and Validation Workshops (ICSTW), 2014 IEEE Seventh International Conference on, pp. 337-342, 2014.
- [3] V. Garousi, M. Felderer and T. Hacaloğlu, "Software test maturity assessment and test process improvement: A multivocal literature review," Information and Software Technology, vol. 85, pp. 16-42, 2017.
- [4] M. Fewster and D. Graham, Software test automation: effective use of test execution tools, ACM Press/Addison-Wesley Publishing Co., 1999,.
- [5] I. Burnstein, T. Suwanassart and R. Carlson, "Developing a testing maturity model for software test process evaluation and improvement," in Test Conference, 1996. Proceedings., International, pp. 581-589, 1996