

Software Testing in Industry and Academia: A View of Both Sides in Japan

Satoshi Masuda
IBM Research - Tokyo
Chuo-ku, Tokyo, Japan 103-8510
Email: smasuda@jp.ibm.com

Abstract—Collaboration between industry and academia is important for solving problems and creating innovations. Both sides of industry and academia are important for each other, but sometimes they are incompatible. In this paper, we discuss software testing in industry and academia from their respective views in Japan on the basis of the author's experiences and studies. High quality software is required and its industry is influenced by economic circumstances. In Japan, there are also problems regarding cost reductions, production of high quality software, adapting businesses, and so on. We have made efforts to solve these problems by collaborating with people in both industry and academia. Our efforts include developing test methodologies, skill standards, education syllabi, and so on.

Index Terms—Software Testing, Software Testing Industry, Industry Academia Collaboration

I. INTRODUCTION

Collaboration between industry and academia is important for solving problems and creating innovations, even in the field of software testing. Industry is under market pressure, and academia requires rigorous research. Both sides are important for each other, but sometimes they are incompatible. In this paper, we discuss software testing in industry and academia from their respective views in Japan on the basis of the author's experiences and studies [1].

The rest of the paper is organized as follows. Section II provides an overview of software testing industry and academic in Japan. Section III raises the challenges for software quality and testing in Japan. Section IV discuss solutions about the challenges.

II. FACTS ABOUT INDUSTRY AND ACADEMIA IN JAPAN

A. Facts about Industry

The Japanese economy has been called the "Lost Decades" since the early 1990s, after the collapse of its economic bubble. During this time, the GDP of the USA has tripled and China's has grown to over ten times as much [2], with Japan's barely changing. Japan is also turning into an aging country. The number of people over 60 years old reached about 25% of its whole population. The number of workers in Japan has been decreasing [3]. The annual market size of the Japanese information services industry is about 2 billion US dollars with about one million people working in the market. Custom application development services occupy half of the Japanese information services industry [4]. Offshoring is one of the solutions to the labor shortage problem [5]. China is one

of the most prominent offshoring countries for the Japanese information services industry. The industry consists of multiple subcontract structures in Japan.

A related work [6] discusses Japanese software industry comparison with U.S. 70% of Japanese software industry is occupied by outsourced customized software, while comparing with 34% of U.S software industry is occupied by them. The related work mentions tiered subcontract firms in Japanese software industry. It is not uncommon that projects led by top vendors are actually carried out by many layers of subcontractors with little involvement by the prime vendor [6].

B. Facts about Academic and Education

About 70% of information technology (IT) engineers graduated from the department of information technology, science, and engineering in their respective universities [7]. About 50% of the syllabus for basic IT education was developed using lectures under the policies outlined in Reference [8]. The Information Processing Society of Japan (IPSJ) established the General Education Body of Knowledge (GEBOK) for general IT education [9]. There are eight areas in the GEBOK covering information and communication, algorithm and programming, information network, and information security. IT education classes consist of 10% at an elementary level, 50% at a basic level, and 20% at an advanced or professional level [8].

III. CHALLENGES FOR SOFTWARE QUALITY AND TESTING

There are still a number of big incidents caused by software problems in financial systems [10], air-line ticketing systems [11], and other important systems in our society, requiring software to be of a higher quality more than ever. The IT industry, however, is under pressure to reduce costs due to economic circumstances. Furthermore, the software that supports a business must change as quickly as the business does.

IV. SOLUTIONS AND ACTIVITIES IN SOFTWARE TESTING

In this section, we discuss the solutions and activities in software testing. In order to keep up with the changes, there are three candidate solutions:

- The first is to use innovated technologies, such as cloud services, social network services, smartphone, etc.
- The second is to apply better processes for software development, such as agile development, the ISO/IEC/IEEE 29119 Software Testing Standard [12], etc.

- The third and final solution is to educate human resources personnel. The education is required for both industry and academia.

In regard to innovation in testing, we made efforts to develop testing techniques and methodologies. One technique is to create a map of software testing techniques to help select those that are appropriate [13]. One type of methodology is how to perform testing efficiently and effectively [14]. This methodology has been developed by the "Software Testing Architecture" community in Japan. To apply better processes, a community for agile testing was established in 2015. Finally, in regard to human resource education, we developed the Test Skill Standard Framework; a software testing skills standard for education [15]. The Test.SSF consists of layers of software testing with details regarding skill items broken down between the layers.

V. CONCLUSION

In this paper, we discussed software testing in industry and academia from their respective views in Japan on the basis of the author's experiences and studies. We have made efforts to solve the problems by collaborating with people in both industry and academia. In future work, we intend to improve the collaboration more, for examples, industry try end feedback to academia, academia provide their work more quickly.

REFERENCES

- [1] S. Masuda, "Challenges in japanese software testing industry and software automation," *Thailand SPIN*, 2011. [Online]. Available: <http://www.thailandspin.com/Portals/0/pdf/200110905-2 Thailand SPIN Japanese Software Tetsing.pdf>
- [2] I. M. F. (IMF), "World economic outlook database," *World Economic and Financial Surveys*, 2011. [Online]. Available: <https://www.imf.org/external/pubs/ft/weo/2016/01/weodata/index.aspx>
- [3] S. B. M. of Internal Affairs & Communications, "Annual report on the labour force survey," *Labour Force Survey*, 2012. [Online]. Available: www.stat.go.jp/data/roudou/120220/zuhyou/hoseiy01.xls
- [4] J. I. T. S. I. A. (JISA), "2015 survey of selected service industries and revised," *Survey of Selected Service Industries*, 2015, in Japanese. [Online]. Available: www.jisa.or.jp/Portals/0/resource/statistics/jittai_chart2015.pdf
- [5] I. T. P. A. (IPA), "Summary of information technology human resources survey 2010," *Information Technology Human Resources Survey*, 2010, in Japanese. [Online]. Available: <https://www.ipa.go.jp/files/000010178.pdf>
- [6] R. E. Cole and Y. Nakata, "The japanese software industry," *California Management Review*, vol. 57, no. 1, pp. 16–43, 2014.
- [7] I. T. P. A. (IPA), "Summary of information technology human resources survey 2016," *Information Technology Human Resources Survey*, pp. 134–149, 2016, in Japanese. [Online]. Available: <https://www.ipa.go.jp/files/000052136.pdf>
- [8] K. Kawamura et al., *Information Communication and Technology Education at University in the Future*. Nikkei BP Marketing, 2016, in Japanese. [Online]. Available: <http://macrobrain.sakura.ne.jp/mbopen/201604IPS.zip>
- [9] K. Kawamura, "Computing in general education," *IPSJ Journal*, pp. 768–784, 2008, in Japanese. [Online]. Available: https://www.ipsj.or.jp/12kyoiku/J07/20090407/J07_Report-200902/9/IPSJ-MGN4907_J07_GE-200806.pdf
- [10] T. J. Times. (2005, Nov) System glitch shuts down tse for hours. [Online]. Available: www.japantimes.co.jp/news/2005/11/02/national/system-glitch-shuts-down-tse-for-hours
- [11] —. (2016, Apr) System trouble grounds jal's domestic flights, affects travelers. [Online]. Available: <http://www.japantimes.co.jp/news/2016/04/01/national/system-trouble-grounds-jals-domestic-flights-affects-travelers>
- [12] I. J. S. 7, "Software and systems engineering — software testing — part 2: test processes," *ISO/IEC/IEEE JTC 1/SC 7*, 2015.
- [13] K. Akiyama, "Testing techniques positioning map," 2011, in Japanese. [Online]. Available: <http://www.hayst.com/Pages/positioning.aspx>
- [14] T. Suzuki, "An example of software testing methodology," *Japan Symposium on Software Testing*, 2011, in Japanese. [Online]. Available: <http://jasst.jp/archives/jasst11e/pdf/A4-3.pdf>
- [15] N. Watanabe and N. Kobayashi, "Skills standard of testing technique for strengthen technical capabilities," *SEC Journal*, pp. 184–187, 2012, in Japanese. [Online]. Available: <https://www.ipa.go.jp/files/000028908.pdf>