A Study of Emerging Trends in Software Testing and Quality Assurance

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ABSTRACT

In this paper we present an empirical study about new technology and trends in software testing and Quality assurance. Year 2016 has a great evolution in the testing space with upcoming trends in IT industry. With the start of Service Oriented Architecture, increase in virtualization and adoption of cloud computing, today testers have a lot of new aspects to consider and going forward industry experts and specialists expect lot more interesting trends in the software testing domains and it becomes a challenge. So are we ready to knock down these challenges?

Keywords--- quality Assurance (QA), Information Technology (IT), Testing Center of Excellence (TCoE), - service-oriented architecture (SOA) and DevOps (a clipped compound of "development "operations"), International Software Testing Qualifications Board (ISTQB)

I. INTRODUCTION

Past research critics on cost reduction, quality and flexibility have endless try to design and develop many ways to improve these sectors are stillcausing impacts to the software industry [1]. One trend is to integrate testing earlier in the development cycle with testing methods like Agile. This often involves companies establishing a Testing Center of Excellence (TCoE) to coordinate testing methodologies with business development in order to build products reliably from the scratch. The other trend is toward independent testing options; either via a third-party firm or crowd sourced testers [2]. Independent testing can offer greater testing coverage and costs less than an in-house QA team.

A. Software Testing Is Evolving Rapidly

The introduction of new architectures such as service-oriented architecture (SOA), increase in virtualization and inclination towards cloud has shaken up the industry and has compelled testers to consider new aspects. Additionally, focus on DevOps has dramatically changed the face of IT.

II. RECENT TRENDS IN TESTING AND QUALITY ASSURANCE

A. Greater Focus On New Technology And Security

New technologies like SOA, cloud and mobile testing are on the rise. According to 2013-2014 world quality report, mobile testing has seen a rapid rise from 31% in 2012 to 55% in 2013. Yet 56% lack comprehensive mobile testing procedures. By 2015, almost 36% of software will be hosted in the cloud but businesses still lack the necessary infrastructure for cloud testing. These might cause businesses to opt for TaaS (Testing as a service) options [3].

System robustness and security has always been a top priority but with growth in social media and mobility and need for software that can be integrated to multiple platforms, systems are becoming more vulnerable. There is a pressing need to ensure enhanced security, particularly in applications handling sensitive data. This is causing QA to focus more on security testing.

B. Higher Automation Levels

With agile testing teams and growing number of TCoEs, and due to high pressure to reduce the time-to-market, testing teams are trying to adopt automation wherever possible [4]. This is not just in regression but also in unit testing and load testing.

C. Continuous Integration Testing

Under this methodology, testing is done in small increments in a production like environment with code integration happening at frequent intervals. This kind of testing helps the tester to detect problems early, measure the effectiveness of a change and determine whether it actually meets end-user expectations.

D. Independent Software Testing

With increased focus on QA, many businesses are relying on specialist QA organizations to provide testing services. This is largely due to the expertise that specialist

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QA organizations bring to the table, including TCoE capability [5]. Hence partnering with them helps the business to circumvent the pain of finding skilled QA resources and setting up a mature QA, both in terms of process and technology. A report from business research firm Nelson Hall states that the independent testing sector will see an annual growth of 9.5% for the next few years.

E. Cloud-Based Testing (Virtualization and Cloud Computing)

As cloud computing becomes an increasing part of the IT mainstream with about 26% of software applications to be hosted on cloud in 2015, IT professionals and experts see a positive growth in the adoption of cloud based testing. For the simple reason, cloud infrastructure offers a convenient solution unlike other test environments which can be difficult and expensive to build and maintain [6]. There are concerns related to data security and performance in cloud based environments which organizations view as a medium term challenge that will be soon addressed. Cloud testing is also flexible, allowing businesses to scale up or down as part of a dynamic testing strategy.

F. Testing in the Agile Development Environment

Companies are working hard to build a holistic testing approach that fits with the agile development methodology and brings in right test tools [7]. Continuous testing is something that we will be seeing a lot as companies today are more focused on getting into the delivery phase without having to wait for long. Testing in production is one approach that will be commonly used by testers in order to provide a constant flow of updates on how the software is shaping up with respect to its features and value to business. Agile methods are in the mainstream. They offer both challenges and opportunities for testers. Agile does not mean one thing, but a collection of many related things. Integration of testing best practices into agile methodologies remains a challenge. Agile Scrum is another development that is changing the manner in which testers operate. This is a flexible, holistic product development strategy that encourages teams to self-organize and communicate regularly. In other words, testers work closely with developers and obtain early involvement and feedback on a project.

G. Context-Driven Testing

A one-size fits all approach is not something that we can rely on when it comes to testing of software applications. There is a need to be adaptable in the event the context changes. This has made context-driven software testing a trend that we expect will emerge strongly in the coming years. According to software testing leaders in the industry, the most successful testers in the future will be the ones that can bring the most skills to the table for any given context or business situation.

H. Open-Source Testing Tools

Agile methods have spin-off many useful open-source test tools like X-Unit, Selenium etc. Test automation skills are essential to take advantage of these tools. Integrated development environments often include related or similar tools.

I. Tester Certification

Tester certification has existed since the 1980s, The ISTQB (International Software Testing Qualifications Board) program brought openness, inclusivity, and global reach. Certification is not about training, but about establishing knowledge. ISTQB program includes a career path. Certification will lead ultimately to an agreement on best practices throughout testers’ careers. Certification is part of professionalization.

- Certified Software Tester (CSTE)
- ISTQB certification
- V & V Manual testing Certification (Organization level Certification)

III. SOFTWARE TESTING INDUSTRY PREDICTIONS FOR 2015

A. Testing Center Of excellence (Tcoe)

Another trend in testing is the concept of TCOE; completely operational TCOE models have effectively grown to 26 percent from a mere 4 percent in the year
2011. A TCOE can be present in multiple forms, it can exist as a pure methodological support, which will control QA and testing or can exist as a complete test execution factory, which will provide on demand testing services to software projects across the organization. Businesses are also looking to set up TCOE’s using a combination of best practices to offer improved governance, process, control and metrics [8].

B. Crowd sourcing – good or bad?

Crowd sourced testing a relatively new trend in software testing, where software applications are made available to a large number of end-users, who will try to identify defects and bugs. Crowd sourced testing services are usually managed by companies ‘as a service’. Interestingly, almost 27 percent of organizations have already experimented with the concept of crowd sourced testing and are willing to continue with this new software testing trend. But I believe that crowd sourced testing can never replace the conventional quality assurance and testing teams.

C. Smac Technologies In 2015

The increasing usage of social media, mobile, analytics and cloud technologies also referred together as SMAC improves operational efficiencies and strengthens relationships with customers and end-users. There is a significant demand from customers, employees and end-users for responsive, anywhere accessible software applications that improve the areas of communication, business and entertainment. The increasing usage of social media is creating “Zero Tolerance” environment, as any failure, error or outage is resulting in immediate exposure to the global audience via social media channels. Organizations will be spending 52 percent of their IT budget towards QA and testing, out of which major allotments are 27 percent for cloud, 40 percent for big data & analytics and 17 percent for mobile.

D. Mobile Application Testing

The mobile application testing trend is going to have a major impact on QA and software testing industry. There has been a steep rise in organizations that are practicing mobile application testing, which stood at 31 percent in the year 2012, but increased to 55 percent in 2013 and 87 percent in the year 2014 and it is not an exaggeration, but the figures may actually rise up to 95 percent by the end of 2015. Functionality testing, security testing and performance testing are the primary focus areas for organizations that are involved in mobile application testing, which are followed by usability testing, regression testing and compatibility testing. Gartner predicts that there will be about four Android devices for every Windows or Apple (iOS) device by the year 2015.

E. Mobile Testing Best Practices

With the rapid changes in mobile technologies, businesses are expecting matured mobile testing practices from organizations offering mobile testing services. Software testing applications should be able to support a wide range of devices and operating systems, which would help in the creation of multiple test scenarios / executions across multiple platforms. The development lifecycle of mobile applications is relatively compact as compared to a standard or a web application; hence it is always a challenge for software testing teams to complete the testing within the allocated time frame [9]. Almost 40 percent of the organizations agree that time is a crucial factor for QA and testing teams, which highlights the importance of automation to perform regression testing.

<table>
<thead>
<tr>
<th>Device Type</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional PCs (Desk-Based and Notebook)</td>
<td>296,131</td>
<td>276,221</td>
<td>264,657</td>
</tr>
<tr>
<td>Ultramobiles, Premium</td>
<td>21,517</td>
<td>32,251</td>
<td>55,032</td>
</tr>
<tr>
<td><strong>PC Market Total</strong></td>
<td>317,648</td>
<td>308,472</td>
<td>316,689</td>
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<tr>
<td>Tablets</td>
<td>206,807</td>
<td>256,308</td>
<td>320,964</td>
</tr>
<tr>
<td>Mobile Phones</td>
<td>1,806,964</td>
<td>1,862,766</td>
<td>1,946,456</td>
</tr>
<tr>
<td>Other Ultramobiles (Hybrid and Clamshell)</td>
<td>2,981</td>
<td>5,381</td>
<td>7,645</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,334,400</td>
<td>2,432,927</td>
<td>2,591,753</td>
</tr>
</tbody>
</table>

Figure 2: PC Gets Boost, Still Outpaced By Mobile
F. Big Data and Analytics

Big data and analytics testing is a catching up trend in software testing domain. It is not only about testing vast chunks of data, but it is all about testing the correctness and accuracy of data (i.e. Obtaining a meaningful and actionable information), which is sourced from multiple platforms [10]. As per my analysis, big data and analytics testing will account for approximately 50 percent of the total software testing budget in the year 2015. Big data and analytics testing applications are highly complex and pose a big challenge to the software testing teams.

The software testing teams will be working with data centric processes and would not only be responsible to identify data irregularities and quality issues, but also figure out performance issues, security concerns, accuracy of ETL processes and most importantly verify, if the sourced data is relevant and suitable for business analytics.

G. Cloud Migration

Despite the odds cloud computing faced in its initial years, it will catch up in the year 2015. Although, we have witnessed a decline in cloud adoption in 2013 (20 percent), but it bounced back and gained momentum by demonstrating a positive trend in 2014 (28 percent) and is expected to reach 32 percent by the end of 2015. Organizations are benefitting immensely by adopting cloud services, especially by building and maintaining cloud environments.

It would be considerably easy for software testing teams in the cloud environment, if they are provided the right environment and desired ramp up to an agreed load capacity. On the contrary, not all software applications can be hosted in the cloud environment e.g. large enterprise systems, which require robust integration testing would have to be hosted in a separate infrastructure test environments. However, the cloud testing trend is here to stay for a foreseeable future.

IV. CONCLUSION

Considering the above software testing trends, statistics and projections, we can confidently predict a bright future for quality assurance and software testing domain, especially in the areas of automation testing, performance testing, mobile application testing and security testing. Software testers need to be prepared and be ready to grab the emerging opportunities in the 13 billion dollar software testing industry.

REFERENCES


