COMPARATIVE STUDY OF SOFTWARE TESTING TOOLS ON THE BASIS OF SOFTWARE TESTING METHODOLOGIES

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ABSTRACT

Software testing is the main phase for the quality assurance of software during the software development life cycle. There are number of automated software testing tools are available to automate the testing process.

In this paper, we will study and analyze testing tools over the types of testing methodologies on the basis of three types of software products web application, application software, and network protocol. The outcomes of this categorization are useful in software testing to know which testing tool is best for a specific type of testing.

I INTRODUCTION

Software testing is the most important phase for the quality assurance of software during the software development life cycle. Software testing is a process carried out by a specialized testing team in which a software unit, several integrated units or an entire software package are examined by running the programs on a computer. Most of the tests are performed according to approved test procedures on approved test cases [1] .The software testing is defined [2] as "the dynamic verification of the behavior of a program on a finite set of test cases, suitably selected from the usually infinite executions domain, against the expected behavior". However, the software testing process can be assisted with software tools to make it automated.

This paper will catalog a set of testing tools and allocate them over the types of software products. We will allocate a set of testing tools over the types of testing for three types of software products. However, the outcomes of this categorization are dedicated to the researchers and practitioners in software testing to know which types of testing have no automated tools.

II SOFTWARE TESTING

Software testing is a process of verifying and validating that a software application or program. Software testing:

1. Meets the business and technical requirements that guided its design and development, and

2. Works as expected.

Software testing also identifies important defects, flaws, or errors in the application code that must be fixed. The modifier "important" in the previous sentence is, well, important because defects must be categorized by severity.

III DIFFERENT TYPES OF SOFTWARE TESTING

There are many types of software testing; in this paper we will only consider the following types:

Stress Testing: it is the testing which conducted to evaluate a system or component at or beyond the limits of its specified requirements to deter- mine the load under which it fails and how. Often this is performance testing using a very high level of simulated load. Performance testing is often done in conjunction with stress testing [3].

Load Testing: it is the testing which conducted to evaluate the compliance of a system or component with specified performance requirements [3].

Regressions Testing: it is the testing which is to be done to software that was previously working correctly and stops working as intended due to changes [4].

Functional Testing: it is the testing which is conducted on a complete and integrated system to evaluate its compliance with its specified requirements [4].

Unit Testing: it is the verification and validation technique where the programmer gains confidence that individual units of source code are fit for use [4].

Performance Testing: it is the testing which refers to the assessment of the performance of a human examinee [4].

Acceptance Testing: it is the testing which involves running a suite of tests on the completed system [4].

Security Testing: it is the testing which determines that an Information System protects data and maintains functionality as intended [4].

Open Source Testing: it is a functional and unit testing framework for open source software products [4].

IV CLASSIFICATION OF THE SOFTWARE TESTING TOOLS

Software products can be categorized to different types on the basis of different criteria (intended usage, complexity, development technology, etc.).In this paper, we will categorize the software products based on their intended usage, that is:

- Application Software.
- Database.
- Network Protocol (TCP).
- Open Source Software.
- System Software.
- Embedded Software.
- Web Application.
- Java Software.

After study and analysis various software testing tools [5, 6, 7, 8, 9, 10], we have categorized them into different

types based on which software product could be applied. Figure 1 shows this classification. From figure 1 we can note that the web application software products have the largest number of software testing tools, this large number of testing tools may be due to the wide usage of web applications on the web sites, and are common to be developed to provide a variety of services to the intended users of such web sites. Whereas, the system software and embedded software products have the smallest number of software testing tools Furthermore, the following is the order of software products types based on descending order software testing tools are intended to be used by such software product types:

- Web Application
- Network Protocol (TCP)
- Application Software
- Java Software
- Open Source Software
- Database
- System Software
- Embedded Software.

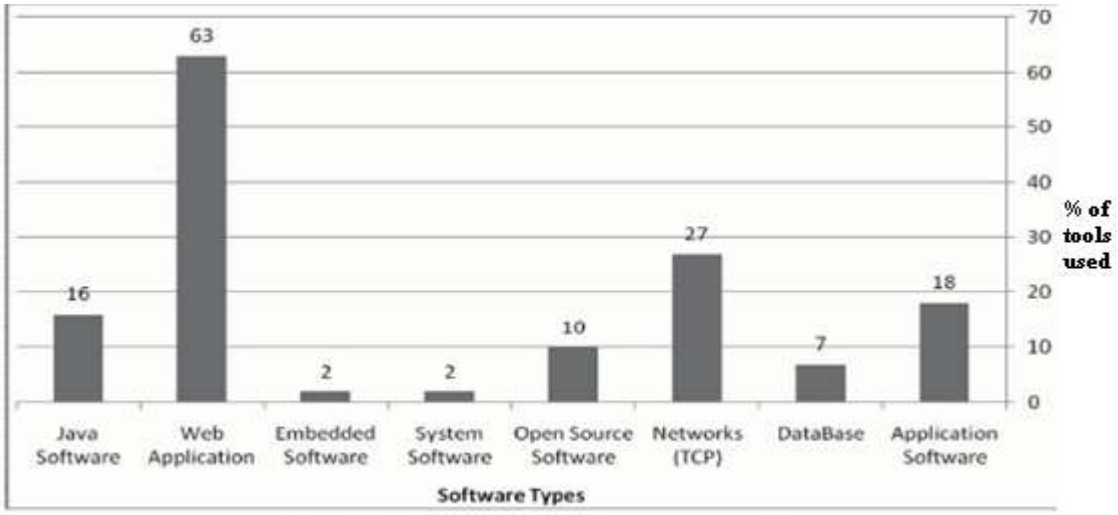

Fig. 1: Distribution of the used testing tools over the software types.

Hereinafter, we will focus on three types of software products, that is, web application, application software, and network protocols (TCP). Also, we selected the common used types of software testing, that is, stress, load, regression, functional, unit, performance, acceptance, security, and open source testing methods. However, after we classify the software testing tools which are built to be used with the web applications, we found that most testing tools are designed to be used for the functional testing. Figure 2 presents the distribution of the testing tools over the types of testing for the web applications. In addition, the smallest number of testing tools is for the unit, acceptance,

and open source testing methods. We should note that there are many testing tools which can be used for different types of testing.

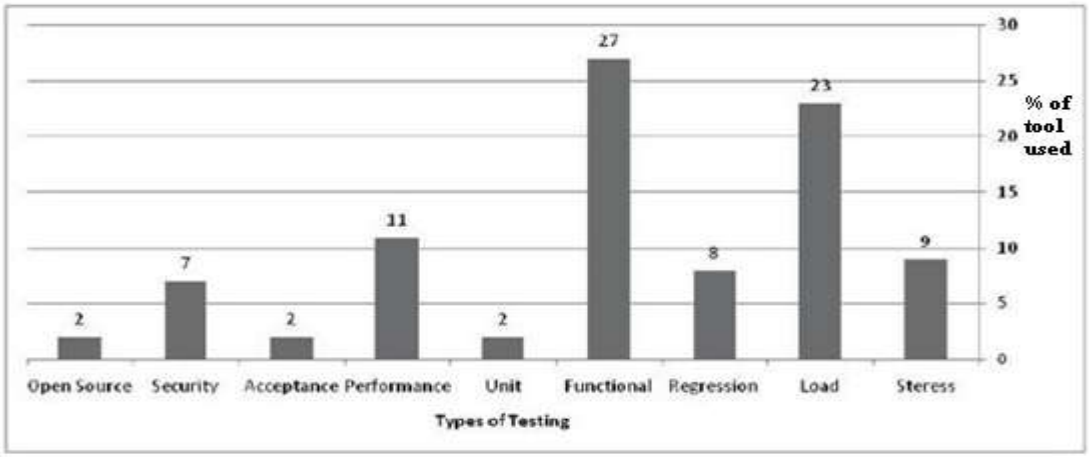

Fig. 2: Distribution of the testing tools for web application over the types of testing.

For the second type of software product (application software), we found that there are 18% software testing tools. After we studied and analyzed these testing tools, we found that the large number of testing tools is intended to be used for the functional testing. For the networks (TCP protocol), there are 27% testing tools. However these testing tools are mostly used for the performance, security, load, and stress testing methods, see figure 3.

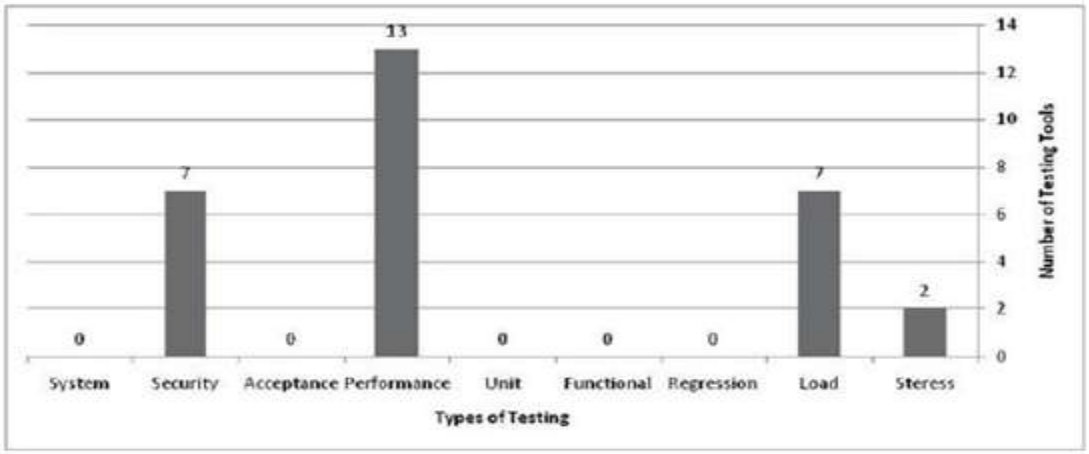

fig 3: Distribution of the testing tools for networks(TCP) over the type of testing

While, the smallest number of testing tools are built for the system and security testing methods. Figure 3 presents the distribution of the testing tools for application software over the nine types of testing. Furthermore, there is no testing tool for the system, acceptance, unit, functional, and regression testing methods. This is due to that network

protocols are special purpose software products.

V CONCLUSION

In the software development life cycle, testing is highly needed to assure the quality of the software process and product. For many years, researchers and practitioners come-up with a variety of software tools to automate the testing process. In this paper, we have classified and distributed testing tools over eight types of software products. Furthermore, we have distributed the testing tools over the types of testing for three types of software products (web application, application software, network protocol).However the outcomes of this classification are dedicated to the researchers and practitioners in software testing to know which testing methods have no automation tools. In addition, this classification gives a direction on which types of tests have limited automated tools. Based on our study and analysis of the testing tool we have concluded that:

- The testing tools for the embedded and system applications are very limited.
- For the web application software products, the testing tools for the unit acceptance and open source testing methods are restricted.
- For the application software products, the testing tools for the security and system testing methods are restricted.
- The testing tools for functional testing in both the web applications and application software product are very common.
- For the network software products (TCP protocol), there is no any testing tool for the system, acceptance, unit, functional, and regression testing methods.

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