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# Metrics for Quality Assurance of Web based Applications

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## Abstract

Web-Commerce applications are now an indispensable aspect of businesses around the world. More businesses are now migrating from outdated applications to a new type of combined ebusiness designs. With such large volumes of applications that need to be put online, there is now a dire need for measurable and quantifiable metrics that can help in gauging the quality of these websites.The development considerations for both domains may be deemed similar in their final purpose, that is to provide a service to its end-users, however, web-applications today face a myriad of constraints, with most businesses opting to go online, the crucial questions are; Is the Web info metrics are any different, or is it just an application of classical metrics (desktop metrics) to a new medium (web metrics).In our research, we propose to investigate these issues, and present the distinguishable metrics for the Quality Assurance(QA) processes involved in Web-Applications, as opposed to traditional desktop software application.

***Index terms***— metrics; measurements; websites; web applications; vulnerabilities; requirements; testing.

## 1 Introduction

usinesses around the world are now migrating from outdated desktop applications to a new class of combined e-business architectures. As the time progresses, businesses will continue to adopt e-business more and more. Metrics are the basic assets of any organization because they deliver appropriate data and information which is used for examining, directing, observing and endorsing [1]. Metrics and Measures values should be replica table and match able between the projects of organization in order to make the examination and policy making processes more strong. With such large volumes of applications that need to be put online, there is now a dire need and motivation for measurable and quantifiable metrics that can help in evaluating the quality of these websites.

The key areas for a web-commerce application that we identified in terms of relevance to the business, the technologies used locally in Pakistan as well as the interests of the stakeholders in Web Projects can be summed up as: i. Performance

In E-Commerce applications, performance issues can be critical since the time to perform any business case or function dictates the actual capability of the system.

ii. Security Online security is perhaps overlooked most often in local software-houses; websites with poor security implementations will invariably damage users and the business.

iii. Ease of Use Quality issues regarding the ease of use of a web application are important in sense that they help a business to retain their client age. Also, such applications are easier to maintain and change.

## 2 iv. SE Optimization or Page Strength

Search Engine optimization is an important quality aspect in the context of an e-commerce application. Page visibility and rankings can be very important in the web-commerce industry.

v. Portability With a growing range of computer hardware and software platforms, it is important for ecommerce applications to be able to perform consistently and provide similar functionality in different computing environments.

vi. Reliability As with traditional desktop software development and online web application development, reliability is always an important quality issue for users [3]. A web application should always produce consistent results and outputs for a given fixed input. Otherwise the application cannot be trusted for high quality service.

A classical approach to Quality Assurance for online applications would be to gather metrics data from a pre-defined set of metrics. The main problem is that the traditional desktop metrics that have been identified for conventional or non-web related applications could understandably fall short of the mark when applied to the domain of web technologies even though if the development considerations for both domains may be deemed similar in their final purpose that is to provide a service to its end-users. [4] This is because of the fact that websites are being accessed by billions of users and every user has its own opinion about the quality of website.

In this paper, we wish to investigate whether the traditional desktop metrics approach is as useful in this domain or not. We will also be scrutinizing the applicability of metrics data to online applications quality assurance and judge whether Website QA is any different from traditional desktop software Quality assurance practices.

We wish to analyse the quality assurance issues related with website development, for this we will be focusing on the key aspects of a website application. The domain of these integrated web-applications will be e-commerce sites. Keeping above quality aspects in mind we propose to move forward with an analysis based upon some of the e-commerce releases and projects from the local market.

So, a variety of research queries was designed distributed by issues as discussed above [5]:

? What are the common metrics requirements for web applications and desktop software applications? ? What are the vulnerabilities found in performance testing? ? What are the impacts on results? II.

# 3 Research Methodology

For our research, we will be using real world project from the local software producers in Pakistan. Our main aim is to first identify a set of key quality aspects and then formulate a workable model for the proper validation of the quality metrics thus identified [6].

To address the problem we have developed a model for this study (shown in figure 1).

A breakdown of the model can be represented as follows:

The above model can assist us in obtaining a fairly consistent set of Web-Metrics that are actually derived from the Client Specifications, keeping the most critical and demanded business functions in view.

# 4 III. Research Site and Data Collection

To support our research on the identification of web-metrics for online applications, we selected the most readily available test data and plans used for an Urdu localization project: An Online Urdu Dictionary (OUD) [7]. The main emphasis of these tests was to test the application for stress conditions and system robustness. The data collected consists mainly of performance testing done on the system, involving input word parameters to the system and gauging the response time of the system.

The tests also involved system search performances by using different word lengths. A detail of the parameters involved in these tests is shown in Table The OUD concentrated their efforts on Performance and Reliability Testing. The Performance was tested on a different set of browser platform, however quality issues such as portability, ease of use were not looked into [8]. For our sample project, the criticality of security and search engine optimization was relatively low.

# 5 IV. Research Results and Data Analysis

Detailed results obtained from the above tests were made available to us for further inspection, a snapshot of the results is shown in Figure 1 and Figure **??**. The 'metrics' regarding web metrics states to the size or measuring the quality of websites. Specially, measuring website actions, and take out their trends [9]. Metrics quantify different attributes in terms of software quality, and are helpful to predict software quality quantitatively during development and after the product is in operation, and are considered as the final component of the SQA program [10].

A graphical representation of the E-Commerce Application metrics attributes thus identified is given below [11] (Figure 1.

# 6 3).

The decomposition is based on the quality attributes, and their importance during different phases of product life [12]. Product operation includes development and deployment as well. During the operations Portability, Search Engine Optimization (SEO), Reliability, Usability, Scalability, Security, and Availability are the key attributes identified [13]. For our purposes, we focused on the performance issues related with the Online Urdu Dictionary (OUD). The testing performed on the system was aimed mainly on stress and robustness (Reliability). The results of the tests reveal that:

# 7 Performance Testing

Other

? For increasing number of word length, the response time also increases linearly. The aim of our study was to investigate the possible deviations from a traditional desktop software metrics approach applied to online applications. During our study, we identified some key metrics that would be essential to the quality of an Online Application. From our discussions we have gathered that a metrical approach that is followed by desktop applications, is also applicable to an Online Web Domain in some scenarios [14], the underlying issues for our case-study sample, the online Urdu Dictionary were somewhat similar to those encountered for offline applications. Some of the metrics attributes identified by us in our research methodology leads to better online applications in terms of security, performance, reliability and ease of use. However, the traditional desktop software application metrics are not adequate and relevant to handle the additional specific metrics of web based applications like search engine optimization (SEO) etc. In case of online applications, performance plays an important role as a key metric and adds to more criticality of the online application because business organizations deal with daily transactions and can't afford the risk regarding performance issues.

The Tests regarding the following metrics attributes must be taken on the above mentioned OUD project, in order to cater the quality assurance measures and issues:

? Security ? Ease Of Use ? Search Engine Optimization(SEO) or Page Strength ? Portability

The analysis by the OUD team does not include anything other than performance measure. All the tests include issues like stress testing or result's response time and overall system testing; No doubt it is an essential part of the analysis (performance) but the above mentioned metrics can't be ignored as far as the quality assurance is concerned.

Concerning about future work, results for the other metrics attributes like Portability, Ease of Use, Search Engine Optimization (SEO) and Security/Risk should also be calculated. How much these attributes are beneficial in web based applications as compared to traditional desktop based software applications (attributes which are applicable on non-web desktop based applications). So we are seeing this as its future development. This can help the initialization of more strong policies, procedures, and approaches. [1] [2]


1

Figure 1: Figure 1 :

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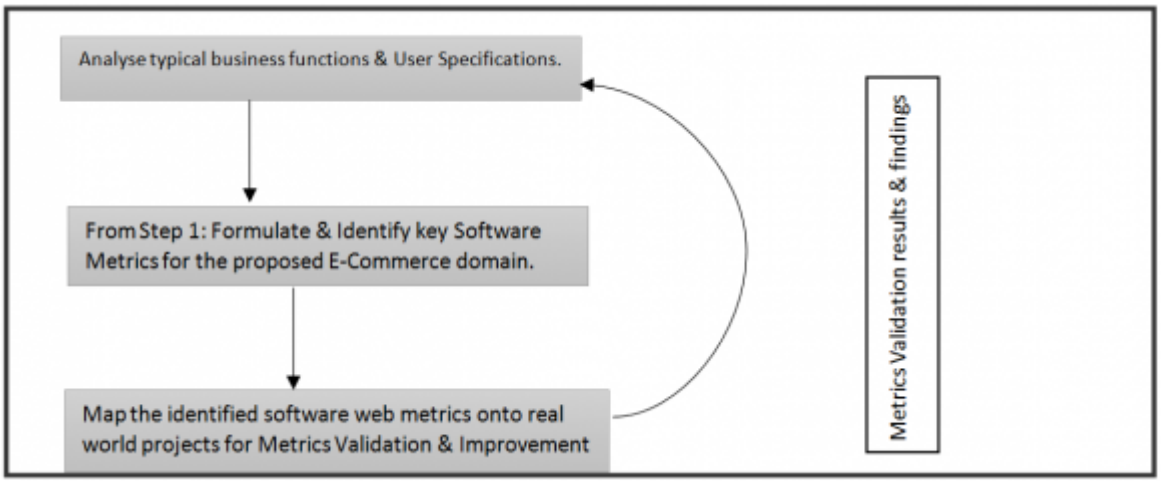


Figure 2: Figure 1 . 2 :

13

Figure 3: Figure 1 . 3 :

21

| <Function ID> | Response Times |
|---|---|
| Exact Word | |
| Using Wild Cards | |
| Idioms | |
| Idioms with wildcard | |
| Input Parameters(Actual Words) | |

Figure 4: Table 2 .Table 1 :

2

Figure 5: Table 2 :

3

| T1 | T2 | T3 | Average | Worst |
|---|---|---|---|---|

Figure 6: Table 3 :

**4**

| Wrong Word | Intended Word | Total Results | Position in Results | Position (Percentage) | Start Time (Seconds) | End Time (Seconds) | Duration (Seconds) |
|---|---|---|---|---|---|---|---|
| | | | | 2 letter words | | | |
| ???? | ???? | 116 | 2 | 1.72 | 19.27 | 23.48 | 4.22 |
| ???? | ????? | 141 | 26 | 18.44 | 30.37 | 35.64 | 5.27 |
| ???? | ???? | 177 | 33 | 18.64 | 44.23 | 49.97 | 5.74 |
| ???? | ???? | 142 | 58 | 40.85 | 52.09 | 55.72 | 3.62 |
| ?ï»?”?? | ?ï»?”??? | 73 | 17 | 23.29 | 57.98 | 59.17 | 1.19 |
| Maximum | | 177 | 58 | 40.85 | 40.79 | 44.80 | 5.74 |
| Average | | 129.80 | 27.20 | 20.59 | | | 4.01 |
| | | | | 3 letter words | | | |
| ????? | ?????? | 90 | 14 | 15.56 | 64.50 | 67.05 | 2.55 |
| ????? | ????? | 41 | 14 | 34.15 | 71.87 | 72.72 | 0.84 |
| ????? | ????? | 35 | 5 | 14.29 | 77.16 | 78.25 | 1.09 |
| ????? | ????? | 44 | Not Found | NA | 82.70 | 83.92 | 1.22 |
| ????? | ????? | 75 | 25 | 33.33 | 88.58 | 91.34 | 2.77 |
| Maximum | | 90 | 25 | 34.15 | | | 2.77 |
| Average | | 60.25 | 14.50 | 24.33 | | | 1.81 |

Figure 7: Table 4 :

**5**

Figure 8: Table 5 :

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