A Proposed Model for Enhance the Effectiveness of E-Government Web Based Portal Services with Application on Egypt's Government Portal

Nashaat El. Khameesy, Dalia Magdi and Haitham Khalifa
Computers & Information Systems, Sadat Academy for Management Sciences, Cairo, Egypt
wessasalsol@gmail.com, daliamagdi@gmail.com, hytham00kh@gmail.com

Abstract

Public authorities have incentivized the enhancement of citizen service provision in developing countries. The concept of web-portal amelioration raised the concern in quality assurance of E-government Portals. Concretely, In Egypt, despite the position reached by the application of E-government initiative in Africa and the Middle East, There are some flaws in the portal project. This paper developed and assessment a model contains quantifiable factors which have been quantified by automatic evaluation implements such as website performance, Accessibility, and Usability. The proposed model validated utilizing numeric data predicated on an exploratory case study of the Egyptian official portal.

Keywords: *Egypt, E-government portal, Quality Assurance, Performance, Accessibility, Usability, Exploratory Case Study.*

1. Introduction

Many developing countries are exploited in the promotion of information communication technology (ICT) to promote governmental services appeal citizen obligations. One key factor that can help to increase the success of E-government is represented by the possibility to provide personalized services that can meet the actual needs and demands of users[1]. Hence, Public authorities have motivated the enhancement of citizen service provision in developing countries.The concept of web-portal improvement raised the business organization in quality assurance of E-government portals. This improvement could be through integrated advancement technologies with capabilities (e.g. Big data, mobile apps, and cloud computing), or through websites development based on recent trends in web structure and content (e.g. Minimalism, card UI pattern, and responsive web design).

More significantly, The integration process is the evaluation process, but this area is still fragmented and modified by different E-government evaluation models.On the issue of E-government website Effectiveness, D. Luo, and Y. Shi (2010) established website evaluation model based on the genetic neural network to evaluate the websites comprehensively based on Rough set theory and genetic, neural network [2]. Theycategorized website Effectiveness into1.website contents, 2.website function, and 3.website construction. This model is a kind of effective method of E-government website evaluation, and also provides a new way of

thinking for the assessment on public websites, but their work has a lack of clarification for website evaluation and various assessment methods which could be useful.

B. Daremand Dr. Suresha (2012) conducted a usability test to evaluate the effectiveness of the current Government websites at the local government in India [3]. The aim of this evaluation is to better understand how website visitors are using the government websites. They used Performance metrics to evaluate the usability of websites. There are five general types of performance metrics that usability test can capture: 1.Task success,2.Time-on-task,3.Task Errors,4.Efficiency,and 5.Learnability.Typically the test was conducted with a group of potential users who have knowledge of computer and internet, but study sample was very limited which were fourteen participants (2 female, 12 male).

As the user satisfaction is an important factor that reflects the effectiveness, B. Thomas et al. (2013) measured the satisfaction of the agrogov.gr website users that designed to provide E-government services [4]. They used the multicriteria satisfaction analysis (MUSA) method, and they used five key evaluation criteria on their websites such as 1.Navigation, 2.Design, 3.Accessibility, 4.Interaction, and 5.Content. Their work ignored the validity and reliability of data accuracy examination. In addition E. Ziemba et al. (2014) proposed a framework for the quality evaluation of E-government portals based on ISO standard [5]. The study focus on eight dimensions that related to website effectiveness such as: 1.Functional suitability, 2.Performance efficiency, 3.Compatibility, 4.Usability, 5.Reliability, 6.Security, 7. Maintainability and 8.Portability.This study was the small sample size and the verified and tested framework by E-government employees only, while some factors of Functional suitability, Performance Efficiency and Usability should be evaluated by citizens and enterprises.

This paper will explicate the lack of the studies practice towards E-government assessment, and highlights relevant factors to the effectiveness of E-government portal. This article is separated into sections as follows. Section 2 offer a comparative analysis of current evaluation models.Section 3 develop and validate a conceptual model to expose the salient factors related to E-government efficiency and to expand an academic context to justify these factors. Section 4 provide a brief description of E-government in Egypt. Section 5 presenta case study to anatomize the strength and the weakness of the Egyptian official portal. Section 6 provide a comparison of assessment results. Section 7 validate the data to dissect the significant factor/sub-factors of the study. Finally, section 8 provide a study conclusions, limitation, and future work.

2. Models for Evaluating E-government Portal

In-depth analysis of E-government evaluation. This section provides a comparison of the current assessment models. Based on literature many E-government models centralized on the assessment of E-readiness, acceptance and success of E-government projects. The evaluation of the websites that interfaces among a government and its citizens also widely examined. From an E-government E-readiness perspective, N. Azab et al. (2009), and Pornchai (2011) provided models for E-government Readiness that focuses on (IT infrastructure, human resources, and regulations) [6, 7]. From a Website structure perspective E. Ziemba et al. (2014), E. Folmer et al. (2011), and O. Rababah et al. (2013) provided models for E-government portal and websites based on ISO 9126 [5, 8, 10]. S. Elling et al. (2012) provided a model for E-government portal assessment based on their experience [9]. These models focus in (Functionality, Usability, Navigation, layout, etc.). Ultimately, evaluation models

that emphasize Website contentedness perspective as X. domichelaki and G. Mentzas (2012)provided a model for E-government services that focus in (Citizen Support, Trust, etc.)[11].

In comparison context, the previous studies indicated some dimensions for the comparison in different articles such as: N. Azab et al. (2009) who compared among E-readiness models based on assessments propose, evaluation criteria, the corresponding regions, and the measurement method used by each model [6]. A. Fath-Allah et al. (2014) compared the existing E-government quality models based on the following criteria: year of published, standard used related to software quality (e.g. ISO 9126, ISO 25010), quality focus, availability of the metrics, quality dimensions, and whether the model is conceptual or has been empirically proven [12]. This comparison will cover the following aspects: Author's (model) name, year, evaluation purpose, evaluation domain, the standard used, and evaluation dimensions. See Table 1.

Table 1.Comparative analysis of E-government evaluation models

Author	Year	Purpose	Domain	Use Standard	Dimensions	Evaluation Method
Azab, N. et al [6]	2009	Develop a framework that assesses EGR focusing on e-administration within publicorganizations, and investigated the internal factors affecting EGR	E-government Readiness	No	1) Strategy 2) People 3) Technology 4) Processes	The study employed qualitative and quantitative data method through distributing a questionnaire to a sample of employees in each organization. Another data gathered from interviews with top management, documentations, archival records, and observations. Testing the research model is performed following the four following steps 1) factor analysis, 2) test multi-co linearity, 3) check reliability and validity of the model, and 4) test the partial models.
Poncho, and bonded [7]	2011	Check ICT readiness for small and medium sized organizations in both public and private sectors	E-government Readiness	No	1) ICT Infrastructure 2) ICT Hardware 3) Software & Information System 4) People	The primary method for these indicators is a document review method while observation and interview processes are optional methods.

Follow Table 1.Comparative analysis of E-government evaluation models

Author	Year	Purpose	Domain	Use Standard	Dimensions	Evaluation Method
Papadomichelakiand Mentzas (e-GovQual) [11]	2011	Develop and validate an instrument to measure citizens' perceptions of service quality from e-government sites or portals	E-government Service Quality	No	1) Reliability 2) Efficiency 3) Citizen Support 4) Trust	The method was a questionnaire through an online survey. The model validated by Cronbach's alpha and confirmatory factor analysis principal components analysis as the extraction method and a Promax rotation method with Kaiser normalization.
Erwin Folmer et al (SETU) [8]	2011	Proposed a model constructed mainly from the field of software engineering to examine the quality of a particular standard (SETU). This model is intended to be used as a self - evaluation tool by standards developers.	E-government Portals	ISO 9126	1) Functionality 2)Reliability 3)Usability 4)Portability 5)Maintainability 6) Adaptability 7)Openness	Just provide documents for SETU standard included guidelines for e-government interoperability improvements.
S. Elling et al (WEQ) [9]	2012	Website Evaluation Questionnaire (WEQ), measured The quality of official websites based on users opinions on various aspects of the site.	E-government Websites	No	1) Navigation 2) Content 3) Layout	The model was tested in laboratory settings on three governmental websites, data analysis by confirmatory factor analysis using Lisrel 8.71
Osama et al [10]	2013	Employ ISO Standard to identify the quality factors to assess the quality of e-government	E-government Portals	ISO 9126	1) Security 2) Availability 3) Readability 4) Content 5) Navigation 6) Trustworthiness	The method was a questionnaire from expert specialists in e-government website development. The validation Using Martin's approach, a stepwise model selection technique combining the forward selection and backwards elimination
EwaZiemba et al [5]	2014	Employ ISO Standard to identify the quality factors measure of e-government portals from different points of views. Moreover, show how e-government portals should be improved.	E-government Portals	ISO 9126	1)Functional suitability 2)Performance efficiency 3)Compatibility 4)Usability 5)Reliability 6)Security 7)Maintainability 8)Portability	Verify and test the proposed conceptual framework. Using feasibility study, and experimental trial

The findings from Table 1 show that the most proposed models that mentioned above to several limitations. In which regard to E-readiness assessment: first Several authors indicated that the most popular assessment models such as (United Nations, world bank, etc.) did not consider all internal factors affecting E-government readiness, and ignored vital elements such as culture, technology acceptance of public officials, quality of ICT in government, and strategic alignment[6].Second E-readiness models are unsuitable or small and medium organizations, in which 80% of public and private agencies in developing countries classified as small/medium organizations [7].Third the efforts by authors to provide suitable E-readiness model shave a small sample size in an empirical study. Their studies depended on the opinions of the employees, and without considering other stakeholders such as citizens and business partners. Fourth the success of this model depended on support from the public agencies, and participation of the third party logistics service providers.

As for the model's evaluated government websites: It is not created based on international standards such as (ISO)except the models created by [5, 8, 10].these model sare not taking into account the considerations and best practices that making it a toughness and are not compatible. Measurement methods that were used to test the selected factors are traditional, and didn't use roads posed by international standards which undermine the credibility test these factors.

3. Developing the Conceptual Model

Based on literature analyzed above an E-government portal evaluation models used traditional measurement methods (e.g. Questionnaires, interviews, etc.), so we found that there is a need to put insight into different methods as automated tools. This section will develop the characteristics of website evaluation by establishing a conceptual model for measuring the effectiveness of the E-government portal. To improve the characteristics of website evaluation, we will present a previous article which discussed the website evaluation methods, review the automatic evaluation tools, and explores which criterion covered by these tools.

3.1 Website Evaluation Methods

In the operation of measuring websites, there are various approaches to evaluating a website. These approaches may be used nested or together to enhance the accuracy of an evaluation process as user questionnaires, behavioral assessment, and automatic tools. D. I. Zahran et al. (2014) presented a different scope on assessment methods with an incipient categorization approach into the purpose and platforms of evaluation. Their categorization included Web and website evaluation methods [13]. The WSEMs test a circumscribed number of websites, manually or automatically, predicated on assigned criteria to achieve a high-quality website. The manual evaluation includes Heuristic evaluation or real user testing, while automatic assessments use software-testing tools. The results of such an evaluation is a list of effectiveness problems and recommendations to improve the tested website. The WEMs check the Web as a whole by calculating statistics about the usage behaviour of a web and providing Web-traffic data, visibility, connectivity, ranking, and the overall impact of a site on the Web such as Web analytics tools and Link Analysis.

3.1.1 Automatic Evaluation Tools

Automatic evaluation tools examine the source code of web pages to determine the compatibility of web pages with specified guidelines. These guidelines may cover universally accepted directives or accepted in a specific society [14]. There are many criteria to evaluate a website. Those may include: usability, performance, traffic ranking, link popularity, functionality, accessibility, security, design patterns, HTML syntax analysis, and browser compatibility. In this research, we focus on website performance, Accessibility, and Usability. The main reasons for this selection are availability for the software, easy of use, and the useful information that received by this software.

3.2 Developing Instruments

This section will provide a brief description for the selected Instruments. This explanation based on previous articles in order to develop the relevance knowledge for web portal evaluation.

3.2.1 Performance

Based on the literature web performance is defined as the ability to offer sufficient efficiency and using a reasonable amount of resources [5]. Website performance includes sub/factors such as (Time behaviour, resource utilization, and capacity), Otherwise in website practices web performance refers to the speed in which web pages are downloaded and displayed on the user's web browser. Higher website download speeds have been shown to increase visitor retention, and loyalty and user satisfaction. Web performance metrics separated into back-end such as (Connection live, image compression, etc.), and front end such as (First-byte time, render time, etc.). Web Site Performance Test (www.gomeznetworks.com), and web page test (www.webpagetest.org) founded as the best tools to measure the performance of the websites.

3.2.2 Accessibility

Web accessibility means users can easily access the site. Also, users have some disabilities to access the site. Visitors can access not only a single page of the site but must be able to visit the whole website [15]. Web AIM web content accessibility guidelines (WCAG) indexed accessibility metrics into a checklist as (Perceivable, Operable, Understandable, Robust) [16]. Accessibility could be testing by 508 checker (www.508checker.com, A-Tester (www.evaluera.co.uk), and WAVE (http://wave.webaim.org).

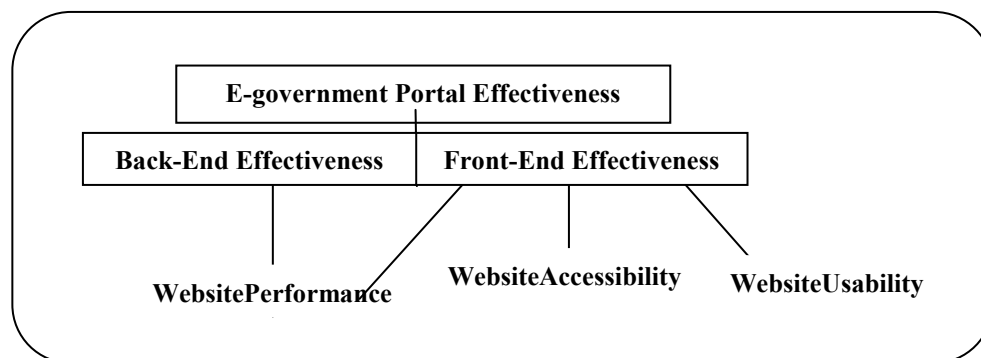**Figure 1.The Research model**

3.2.3 Usability

ISO 25010, (2011) defined Website usability as "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." [17]. in usability evaluation organizations able to check user interface within broken links, colour combinations, and navigation [14]. Hence, Xenu's Link Sleuth (http://home.snafu.de/tilman/xenulink.html) is useful software to check broken links, and others errors related to the website usability.

The literature and theoretical analysis that mentioned above offer the basis for proposing a conceptual model that maps almost evaluation themes see Figure 1. This model provides the frame of reference for conducting the empirical study to explore the factors influencing E-government effectiveness in an Egypt context.

In particular, the conceptual model will provide the overall structure and guidance on the key lines of inquiry in exploring the weakest points in the Egyptian government during their E-government implementation initiative. It is expected that the proposed model would be embraced by developers of changes in government organizations, especially when developing E-government portals. The model should also allow practitioners such as IT managers and researchers to analyze better and explore the implementation aspect of e-government portals.

4. E-government in Egypt

The NCITP has been planned for implementing the Egyptian information Society Initiative (EISI) since 2001.EISI initiative has been separated into seven major related Projects as E-readiness, E-learning, E-government, E-health, E-business, and E-culture. The E-government program implemented by MOCIT in collaboration with the ministry of state for organizational development [18]. The Government of Egypt inaugurated E-government portal (www.egypt.gov.eg) in January 2004. Some services were placed in the portal to pilot test the project such as (telephone E-billing, birth certificate, issuing, etc.). This project designed as a 'one-stop shop' for all government services ranging from simple queries, submitting forms, and full transaction. This project has been designed and implemented in cooperation with Microsoft. It is a gateway to government services providing citizens and businesses with essential public services through connecting with multiple service providers [19].

Several challenges hinder the implementation of E-government. These challenges broadly categorized into social, economic, and technological issues.T. Gebba, and M. Zakaria (2012), and MCIT, (2004) specified several problems encountered in E-government implementation in Egypt that shown in Table 2 [18, 19].

Table 2.EISI challenges

Perspective	Challenges
E-Readiness	1. Legal and regulatory challenges: - Remote authentication mechanism. - Security and privacy issues. 2. Technological challenges: - Lack of unified standards - Multiple service providers - Isolated communication islands of government bodies. 3. Culture and economic challenges: - Poor penetration of credit cards - Inexistence of suitable e-payment method.
Services Quality	- The reputation of the quality of services. - Inconvenience of delivery mechanisms - Overlap among service providers. - Computer illiteracy and low PC and internet penetration.
Expenditure	- Reluctance and mistrust of automation. - Inflexibility to modify workflows (wrongfully thinking it is illegal) - Multiple auditing bodies. - Overlapping authority among government institutions.
Decision-making Process	- The reluctance of information sharing among government bodies. - Security and privacy issues. - Ownership and copyright issues.

According to H. Abdelhafez, and A. Amer (2014) Egypt still faces many challenges in its E-government programme. Egypt needs to focusing on issues related to security, privacy and trust of using e-service, providing IT skills and computer or the internet programs will increase the citizen's awareness of using online services, transforming the traditional government processes to fully online services as well as improving the efficiency of the public sector [20].

5. Case Study Design

An exploratory case study was fulfilled to establish a proposed model based evaluation and examined the real state of Egypt's web portal. The case study conceived by considering the five components that are: the purpose of the study, underlying conceptual model, research questions to be addressed, sampling strategy, and methods employed.

5.1 The Purpose of the Case Study

The purpose of the case study is to discover Performance, accessibility, and usability problems. The conceptual model that links the phenomena to be studied is the idea based on integrating effectiveness evaluations within automatic assessment tool processes. The research questions that are intended to be address are:"what is the model that could best evaluate E-government portal effectiveness involving factors affecting E-government website implementation?".

5.2 Sampling Strategy

The sampling strategy of the case study is based on an embedded single-case design. This study planned to test the main page of the Egyptian official website project (www.egypt.gov.eg)extendingto measure the most popular services which include: National ID Extract service (www.cso.gov.eg), Train Tickets Reservation service (www.enr.gov.eg), Traffic prosecution services (www.egypt.gov.eg/Services/LoadxtrServices.aspx). Moreover, most important links which include: Government complaint portal (http://www.complain.idsc.gov.eg), Governmental job vacancies (http://jobs.gov.eg), Government procurement (https://etenders.gov.eg), Doing business (http://www.egypt.gov.eg/services/LoadxtrServices.aspx). In addition newest services provided by the electricity regulatory facility device as: Submission of electricity meter reading (http://www.egypterases.com), Electricity consumption calculator (http://egyptera.org/ar/Default.aspx).

5.3 Evaluation Plan

This section will define the evaluation plan by following website effectiveness evaluation. The types of website evaluation, including Performance test by AOL webpage test (http://www.webpagetest.org/about).webpagetest is an open source program that is developed and supported by Google to make the website faster. In the case of accessibility test, WAVE (http://wave.webaim.org) is a suite of tools for facilitating web accessibility evaluation by providing a visual representation of accessibility issues within the page. Also, one of the most common usability problems is broken links on the website. Websites require certain maintenance tasks as checking links to make sure they all work. Xenu's Link Sleuth tool (http://home.snafu.de/tilman/xenulink.html) grabs a root webpage and scans it thoroughly to test every single link to check they all function properly.

6. Data Collection

Quantitative research methods will be employed To determine the fit of the proposed model. Data collection method is an exploratory observational approach. In an observational setting, the factors are measuring without specific hypotheses. A bunch of factors is collected to see which ones have the most affect the response factor.

In performance case, URL's addresses for the sample which mentioned above are declared in the address box in webpage test page. The connection setting is (DSL, 1.5Mbps/384Kbps, 50ms RTT), and the test count = (1). The results contain the factors related to front-end website performance, such as (First-byte time, render time, speed index, etc.), and factors related to back-end performance, such as (keep-alive connection, Gzip Compression, progressive jpeg, etc.).The Accessibility test using (WAVE) that installed as an extension for Chrome browser. The results present three categories of errors (Red flag errors) which refer to the web structure errors, (Yellow flag errors) which refer to the website content errors, and (Black flag errors) which refer to the very low contrast. Link verification tested by (Xenu's Link Sleuth). Web pages tested within Parallel Thread = (31), with maximum depth = (999) setting, and the results contain (Broken links, bad local link, skip type, etc.).

6.1 The Finding from Data Collection

This section will present a Comparison review for the measurement results. The data contain the measured criterion results as web performance, web Accessibility, and web usability (Broken links) within the selected areas such as website main page, popular services, and newest services The finding from Figure 2 present some conclusions which are simultaneously evaluating the quality of services provided to the users of the website www.egypt.gov.eg.
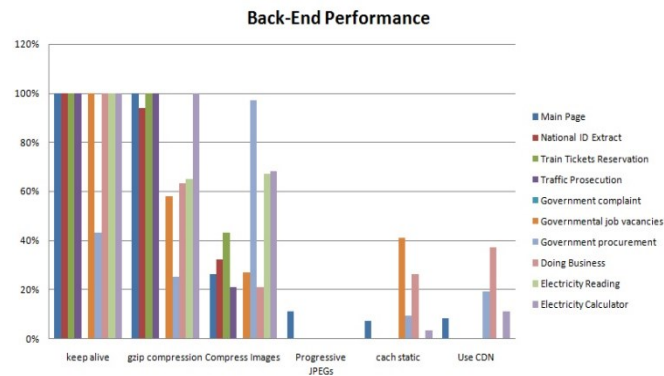

Figure 2. Back-End results

As regards to Back-end performance for the website, the best criterion is keep alive with and gzip compression with 100% for all pages except Government complaint, and procurement pages. Compress images capabilities are low for all pages except Government procurement with 97%, Electricity Meter Reading with 67%, and Electricity calculator with 68%. The worst criterion in Back-End performance for all pages is Progressive JPEGs, CDN with, and cach static.

In Front-End performance, Figure 3 show that the best First Byte time is 181ms for Government complaint, 310ms for electricity reading, 456ms for doing business, 474ms for job vacancies. The worst first-byte time is 1939ms for electricity calculator page. According to HTTP Archive statics [21], speed index average is 4493ms. Hence, all pages received good speed index score except Government procurement received 12426ms, the main page received 9097ms, and train tickets reservation got 7005ms.
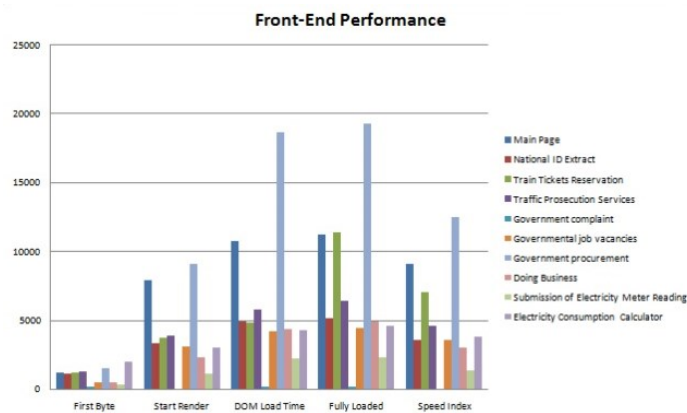

Figure 3.Front-End results

In Accessibility case, Due to the increased number of sub-factors we are indexing this sub-factor according to WCAG 2.0 Checklist by [16]. The finding from Fig 4 indicated that the most errors for all pages related to Perceivable criterion by 51%, navigable errors got the second by 24%, understandable and operable errors for all pages got 0.084%. Finally Adaptable and Compatible got 0.036% for all pages.
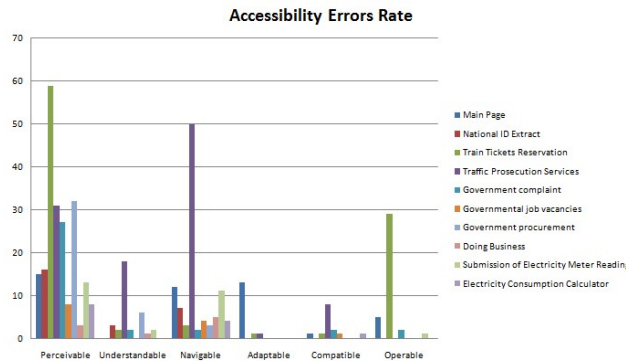

Figure 4.Accessibility test results

In the Usability case, Fig 5 indicates that the most errors for all pages related to broken links by 57% and a timeout by 37%. All other criterions have slight error rates that nearer to zero.
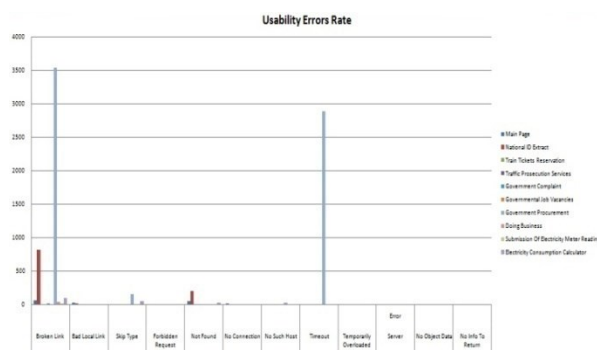

Figure 5. Usability test results

Upon completing the data collection phase, we are able to recognize the main issues that exist in the official website in Egypt. Such problems can be summarizing into the following: First lack of capabilities: that seen in relation to the slightly use of jpeg progressive technologies, small content delivery network sources, and minimum size of website cash. Second lack of website reengineering: accessibility and usability errors rate show that there are careless for continuous improvements for web pages and existed services.

7. Model Validation

In data analysis context, the study will use the machine learning methods. ML techniques analyze the qualitative data by classification, and the quantitative by regression. The nature of research data is numeric. Hence, regression techniques will be employed. Testing the research model in this case study will perform the following steps:

7.1 Set Prediction

Regression is a form of prediction to predict values of attributes, without those being explicitly observed before evaluation by employing the usage of machine learning algorithms such as (Isotonic regression, linear regression, k nearest neighbor).By WEKA experimenter we found linear regression is an excellent, simple method for numeric prediction, and it has been widely used in data prediction for accuracy improvement. Blow some of the examples of Prediction results using weka v.3.8 by linear regression method under training test-set, see Fig 6.
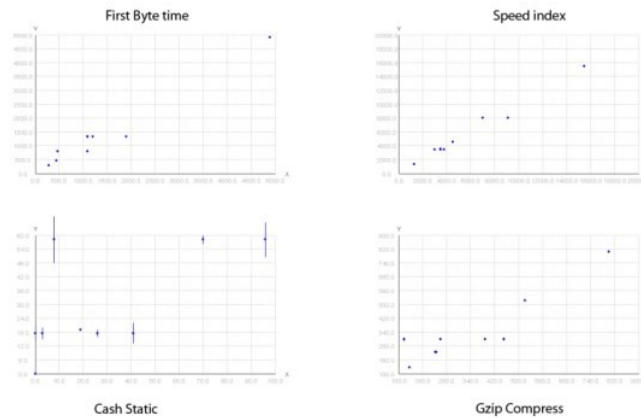

Figure 6.Plot for observed performance factors of LR

7.2 Reliability and Validity

Reliability has two dimensions as repeatability and internal consistency. Internal consistency refers to the ability of a scale item to correlate with other items in the scale that are intended to measure the same Factor. We use coefficient alpha to measure the internal consistency of a measurement sub-factors he coefficient of determination ($R2$) summarizes the explanatory power of the regression model and is computed from the sums-of-squares terms.

Table 3. Reliability of measurements

Factor	Coefficient Alpha	Sub-Factor	Coefficient Alpha	Factor	Coefficient Alpha	Sub-Factor	Coefficient Alpha
Performance	0.33125	Speed index	1	Usability	0.8066	Broken links	1
		D-load time	0.89				
		F-load time	0.76			Bad local link	1
		G zip	0			Not found	1
		C- images	0			No such host	0.98
		CDN	0			Skip type	0.86
		F Byte Time	0			Timeout	0
		S R Time	0				

Factor	Coefficient Alpha	Sub-Factor	Coefficient Alpha
Accessibility	0.48833	Navigable	0.99
		Adaptable	0.99
		Perceivable	0.95
		Understandable	0
		Compatible	0
		Operable	0

The correlation can have a value: (1) for a perfect positive correlation, (0) forno correlation (the values do not seem linked at all), and (-1) for a perfect negative correlation

[22]. From Table 3the usability has a very high positive reliability with (0, 8066). Performance and accessibility have a very low positive reliability with (0.331, 0.488).

To validate the research model, we need some way to measure how well its predictions match the observed data. Several alternative measures used to evaluate the success of numeric prediction. In the regression setting, the most commonly-used measures are the mean absolute error (MAE), and root mean squared Error (RMSE).These quantities are used to measure how close forecasts or predictions are to the eventual outcomes. MAE and RMSE are known as a scale-dependent accuracy standard. They are usually similar, but MAE slightly smaller than RMSE. If the predicted responses are very close to the accurate responses, The RMSE will be small. The relative absolute error (RAE) and relative squared error (RSE) can be comparing to models whose errors are measuring in the different units.

Table 4.Results of model validation

Factor	Sub-Factor	MAE	RMSE	RAE	RRSE
Performance	Compress images	0.12	0.13	76 %	78 %
Performance	CDN	0.14	0.14	80 %	81 %
Performance	Gzip compression	0.16	0.18	70 %	70 %
Usability	Nosuchhost	0.27	0.32	12 %	14 %
Performance	First Byte Time	0.44	0.54	87%	91 %
Performance	Start Render Time	0.46	0.55	54 %	61%
Performance	Document load time	0.53	0.61	29%	32%
Usability	Skip type	0.90	1.06	12 %	14 %
Performance	Speed index	1.03	1.46	56%	77 %
Accessibility	Compatible	2.76	4.22	100%	100%
Performance	Fully load time	3.66	4.48	138%	162%
Accessibility	Understandable	6.38	9.40	100%	100%
Accessibility	Adaptable	13.28	20.96	796%	1210 %
Accessibility	Navigable	15.94	25.92	101%	101%
Accessibility	Operable	28.54	48.95	539 %	926 %
Usability	Bad local link	31.92	54.17	406 %	593 %
Accessibility	Perceivable	41.09	70.53	418%	679%
Usability	Not found	56.39	97.09	81 %	89%
Usability	Timeout	250.01	411.79	82 %	135 %
Usability	Broken links	275.83	454.18	69 %	114%

S. Vijayasarathy and J. Chatterjee (2015) indicated that the RMSE is the measure of accuracy. It will be ideal, while it is small, and values closer to zero are better. MAE is a statistical measure of how far an estimate is from the actual value, and it is to be ideal if it is smaller than RMSE [23].As shown in Table 4the best factors which fit indices are performance. The performance includes sub-factors: Compress images with (RMSE: 0.13) CDN with (RMSE: 0.14) G zip compression with (RMSE: 0.18), and usability which includes sub-factor: no such host with (RMSE: 0.32).

8. Conclusion and Limitations

The primary goal of this paper proposes a model that provides an exploratory reasoning for the most significant factors that hinder Government portal effectiveness focusing on Website performance, Accessibility, and Usability. An exploratory case study has been provided using observation quantitative research methods. Study planned to measure the main page of Egypt's portal, most accessible services, and important link. The study employed automatic evaluation tools for data collection. The finding from measures shows that there an apparent failure in Performance, accessibility, and usability. Reliability and Validity result show usability have very high positive reliability with (0, 8066), Performance and accessibility have a very low positive reliability with (0.331, 0.488). The best factors which fit indices are a performance which includes sub-factors: Compress images with (RMSE: 0.13) CDN with (RMSE: 0.14) G zip compression with (RMSE: 0.18), and the usability which includes sub-factor: no such host with (RMSE: 0.32).

The findings provide useful recommendations for the development of practice. Administrations, and teamwork (designer, and developers) who responsible on Egypt official portal can improve E-government portal development through monitoring performance, Accessibility, and Usability of the website. So there is an urgent demand to improve the back-end web performance to gain faster website, interface design, and navigation of E-government website to be more efficient and usable for the citizens. The limitation of this study was a simple size of the sample, Which there are 72 services provided. This study interested in technical perspectives more than other such as user opinions. The study was done based on quantitative data collected without qualitative data that could be useful for empirical research.

In Future work, There is an opportunity to transform the model into guidelines. This guidelines could be useful to develop the architecture of E-government portal in Egypt. The development process by As-Is To-Be framework, and centralized in standard concept in an infrastructure project that includes four old basic documents, and in continuous improvement process that applied in services delivery project.

References

[1] J. Jaafar, N. Hamza, B. Hassan, and H. Hefny,"A proposed Security Model for E-government Based on Primary Key Infrastructure and Fingerprints." Egyptian Computer Science Journal (ECSJ'14), Cairo, Egypt, Vol. 38, 2014, PP. 85-100.

[2] D. Luo, and Y. Shi, "Evaluation on E-government Websites Based on Rough Set and Genetic Neural Network Algorithm." In Proc of (ISCSCT'10), Third International Symposium on Computer Science and Computational Technology, Jiaozuo, P. R. China, Vol. 14-15, 2010, PP. 124-128.

[3] B. Darem, and Dr. Suresha, "Experimental Evaluation of Effectiveness of E-government Websites." International Journal of Emerging Technology and Advanced Engineering (IJETAE'13), Mysore, India, Vol. 2, 2013, PP.469-473.

[4] B. Thomasa, M. Basila, M. Christinaa, K. Fedraa, and T. Manuelaa, "Measuring Users Satisfaction of an E-government Portal." In Proc of (HAICTA'13), 6th International Conference on Information and Communication Technologies in Agriculture, Food and Environment, Thessaloniki, Greece, Procedia Technology, Vol. 8, 2013,PP. 371-377.

[5] E. Ziemba, T. Papaj, and D. Descours, "Assessing the Quality of E-government Portals." In Proc of the Federated Conference on Computer Science and Information Systems (FEDCSIS'14), Poland, Vol.2, 2014, PP. 1259–1267.

[6] N. Azab, S. Kamel, and G. Dafoulas, "A Suggested Framework for Assessing Electronic Government Readiness in Egypt." Electronic Journal of E-government (EJEG'09),Vol. 7, 2009, PP. 11 – 28.

[7] P. Chanyagorn, and B. Kungwannarongkun, "ICT Readiness Assessment Model for Public and Private Organizations in Developing Country" International Journal of Information and Education Technology (IJIET'11), Thailand, .Vol. 1, 2011, PP 99-106.

[8] E. Folmer, M. Bekkum, P. O. Luttighuis, and J. Hillegersberg "The Measurement of Quality of Semantic Standards: The Application of a Quality Model on the SETU Standard for E-government".In Proc of the EURAS Standards for Development, Netherland, 2011, PP. 81-94.

[9] S. Elling, L. Lentz, M. Jong, and H. Bergh, "Measuring the Quality of Governmental Websites in a Controlled Versus LaboratorySetting with the Website Evaluation Questionnaire" Government Information Quarterly, Netherland, vol. 29, 2012, PP. 383–393.

[10] O. Rababah, T. Hamtini, O. Harfoushi, B. Al-Shboul, R. Obiedat, and S. Nawafleh "Towards Developing Successful E-government Websites," Journal of Software Engineering and Applications (JSEA'13), Jordan, vol. 6, 2013, PP. 559-563.

[11] X. Papadomichelaki, and G. Mentzas, "E-Govqual: A Multiple-Item Scale for Assessing E-government Service Quality" Government Information Quarterly,Athens, Greece, vol. 29, 2012, PP. 98–109.

[12] Fath-Allah, L. Cheikhi, R.E. Al-Qutaish, and A. Idri, "A Comparative Analysis of E-Government Quality Models", International Journal of Social, Education, Economics and Management Engineering (ISSRI'14), Vol. 8, 2014, PP. 3431-3435.

[13] D. I. Zahran, H. A. Al-Nuaim, M. J. Rutter, and D. Benyon, "A Comparative Approach to Web Evaluation and Website Evaluation Methods." International Journal of Public Information Systems (IJPIS'14), Vol. 1, 2014, PP 21-39.

[14] S. Kaur, "An Automated Tool for Web Site Evaluation" International Journal of Computer Science and Information Technologies (IJCSIT'12), Vol. 3, 2012, PP 4310 – 4313.

[15] W3C, 2012 "Introduction to Web Accessibility", availableat:https://www.w3.org/WAI/intro/accessibility.php.

[16] Web AIM, 2016 "WCAG2.0 Checklist." available at: http://webaim.org/standards/wcag/WCAG2Checklist.pdf.

[17] ISO, 2011 "ISO/IEC 25010: Systems and software engineering– Systems and software Quality Requirements and Evaluation (SQuaRE) – System and software quality models," available at: https://www.iso.org/obp/ui/#iso:std:iso-iec:25010:ed-1:v1:en.

[18] T. R. Gebba, and M. R. Zakaria, "E-government in Egypt: An Analysis of Practices and Challenges." International Journal of Technology and Management, Vol. 1, 2012, PP. 11-25.

[19] MCIT, 2004 "EISI-Government The Egyptian Information Society Initiative for Government Services Delivery".available at: http://www.egypt.gov.eg.

[20] H. A. Abdelhafez, and A. A. Amer, "E-government in Selected Arab Countries: Analysis & Challenges." Egyptian Computer Science Journal (ECSJ'14), Vol. 38, 2014, PP. 67-84.

[21] HTTP Archive, 2013. "Interesting stats" available at: http://httparchive.org/.

[22] Mathsisfun, (2016). Correlation test available at: http://www.mathsisfun.com/data/correlation.html.

[23] S. Vijayasarathy and J. Chatterjee, "Comparison of MLR, Isotonic Regression and KNN Based QSAR Models for the Prediction of Inhibitory Activity of HDAC6 Inhibitors" International Journal of Life Sciences Biotechnology and Pharma Research, Vol. 4, 2015, PP. 127-131.