A Heuristic Evaluation of Iraq E-Portal

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Abstract—The integration of Information Technology (IT) and Communication Technology (CT) creates Information and Communication Technologies (ICTs), which has changed the citizens' lives and the manner they interact. Therefore, the governments around the world took serious steps to adopt and implement ICT to provide the best services to their citizens. However, these governments have focused only on adoption and implementation of these new technologies and not so much on their usability aspect. This paper aims to investigate the usability of e-portal in Iraq based on the citizens' standpoint. The e-portal in Iraq has seen a decline of the number of citizens who visit the portal to conduct transactions electronically, which is due to the improper design that does not attract the citizens and stakeholders to browse and use it. Moreover, this study is based on a heuristic evaluation, which aims to capture citizens' standpoint of usability on this e-portal. The results indicated that out of 10 principles, 5 and 7 were inappropriate design.

Index Terms—Usability Evaluation; Mobile Device; Tracking Application; Systematic Literature Review.

I. INTRODUCTION

In this decade, the integration of Information Technology (IT) and Communication Technology (CT) creates Information and Communication Technologies (ICTs), an extremely dynamic technologies hybrid capable not only to increase to the utmost degree the speed and quality of information processing but also to establish effective direct communication channels between stakeholders. In addition, Al-Faries, Al-Khalifa, Al-Razgan and Al-Duwais [1] said that modern communication technology had changed the citizens' lives and the manner they interact.

Therefore, the governments around the world took serious steps to adopt and implement modern technologies (for instance website and Internet) to provide the best services to their citizens. One of this technique is known e-government portal (or called e-portal), harness this phenomenon in the public sector will aim to reduce costs and enhance services quality for the citizens [2]. Moreover, the current e-government portal literature is focused on adoption and implementation (such as Weerakkody, Irani, Lee, Osman & Hindi [3]; Al-Hujran, Al-Debei, Chatfield, & Migdadi [4]), while little research is focused on the usability aspect [5]. In the same context, Huang and Benyoucef [6] stated that while electronic government project such as "portal" has seen significant growth, it can still benefit from better user engagement, and usability is believed to be among the factors that influence such engagement. Nevertheless, the number of empirical studies concentrates on the usability of e-government portal is still limited [7]. For this reason, this study seeks to assess the usability of e- portal in Iraq based on a heuristic evaluation. In the following section, the researchers will highlight this phenomenon in depth. E-

portal, in general, is aimed to provide services to citizens through digital ways to perform their work anytime and anyplace. With this advantage that is brought by e-government, Al-Faries et al. [1] stated that usability of and accessibility e-government portal is essential to citizens' having a smooth online transaction.

Also, according to an intensive study carried out by Kuzma, Yen, and Oestreicher8, they found that the websites for many governments around the world are not functioning well and do not meet citizens' expectations. For developing countries like Iraq, the percentage of failure of e-government adoption is high due to the gap between the design and reality9. Therefore, Hasan, Morris, and Probets [10] asserted that to be successful, websites need to have good usability.

More precisely, the e-portal in Iraq has seen a decline of the number of citizens who visit the portal to conduct transactions electronically, which is due to the improper design that does not attract the citizens and stakeholders to browse and use it [11]. Youngblood and Mackiewicz [12] confirmed that problems of usability definitely could have severe ramifications regarding pursuing online government services and trust in government by citizens. Also, lbayrak and Cagiltay [7] stated that usability issues are deemed as one of the reasons why electronic government portal is underused. This reason is also referred by Leist and Smith [13].

Against this backdrop, this paper aims to assess the e-portal' usability in Iraq based on the citizens' standpoint. In addition, the heuristic evaluation technique will be harnessed in the current study to extract the critical issues related to this phenomenon.

II. THE AIM OF THE STUDY

The principal aim of this paper to conduct an empirical study that assesses the usability of the current electronic government portal in Iraq. Also, this study is based on a heuristic evaluation, which aims to capture citizens' standpoint on the usability of this e-portal.

III. LITERATURE REVIEW

The prior literature is significant for each research and discipline. According to Cresswell [14], the researchers can identify the problems or the critical issues with real life or from a gap in the literature. Therefore, in this section, the researchers strive to highlight common topics that are related to the present usability study.

A. Usability
Usability is one of the most important and essential quality factors for Web [15]. In fact, there are several definitions of usability in each research context. About human-computer

interaction (HCI), ISO17 defined usability as "the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use". Also, in the context of Software Engineering, the definition of usability that proposed in the ISO 9126-1 [17] was most widely accepted. It defined the usability as "the capability of the software product to be understood, learned, operated, attractive to the user, and compliant to standards/guidelines, when used under specific conditions". This study focuses on the usability of a website. Therefore the more suitable definition for this study is by Keevil [18], who said that usability mentions to how easy it is to find the website and how easy website is to understand and use the information displayed on the website.

As for usability problems, many researchers asserted that usability problems are a significant deterrent to internet use and are essential for users' perspectives of a website. More methods and tools were emergence to address the web usability problems and also to develop more usable websites. The figure below depicts the usability problems in websites.
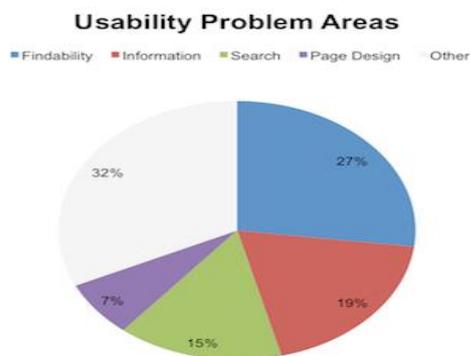
Figure 1: Usability issues [22]

B. Usability Evaluation Methods

Usability evaluation methods (UEMs), which are specially crafted for the web, and technologies that support the usability design process, have therefore become critical [19]. In general, a UEM is a process which is consisted of a set of well-defined activities for gathering usage data related to end-user interaction with a software product and/or how the specific properties of this software product contribute to achieving a certain degree of usability [20].

According to Fernandez, Insfran and Abrahão [15] usability evaluation methods are divided into two different kinds which are: inspection methods and empirical methods. About Empirical methods, it is based on capturing and analysing the raw of data from end-users. In fact, in this kind of method, real end-users employ the software product (or a prototype) to complete a predefined set of tasks while the tester (human or specific software) records the outcomes of their work. After that, analysis these outputs can offer rich information to detect usability problems over completion the tasks by end-users. While, in the inspection methods the expert evaluators or designers consider as the main actor in the evaluation procedures and are based on reviewing the usability aspects of web artefacts, which are commonly user interface, about their conformance with a set of guidelines. In prior literature, many studies used a variety of usability evaluation methods with new technologies. Table 1 below summarises some of the prominent methods to evaluate the usability of websites:

Table 1
Summary of Previous Studies That Used Usability Evaluation

Usability evaluation method (s)	Studies
Heuristic evaluation	Oztekin, Nikov and Zaim [22], Nielsen and Loranger [22], and Allen, Currie, Bakken, Patel and Cimino [23].
Cognitive Walkthrough	ISO [24], Clayton, Biddle and Temper [25], and Filgueiras, Martins, Tambascia and Duarte [26].
Perspective-based inspection	Conte, Massolar, Mendes and Travassos [27], Costabile & Matera [28], Ivory and Hearst [29]
WAMMI-Web	Kirakowski and Claridge [30] and A Jabar, Usman and Awal [31]

C. Heuristic Evaluation

The heuristic evaluation examines the interface to judge how well it conforms to recognised usability principles [32]. According to Otaiza, Rusu and Roncagliolo [33] heuristic evaluation is quite inexpensive and easy to run and can reveal many usability problems. In this same context, Wixon [34] stated that Heuristic evaluation is often called a discount testing method because it is less expensive than laboratory tests. In general, heuristic evaluation is for cheap, quick, and easy evaluation of a user interface design.

Nielsen [35] defines the heuristic evaluation "is an informal method of usability analysis where some evaluators are presented with interface design and asked to comment on it" much prior research referred that, the heuristic evaluation is deemed as one of the most popular methods to assess the usability. Desurvire and Thomas [36] found that Nielson's evaluation (heuristic evaluation) not only predicted problems of the usability that observed in laboratory studies but also encouraged assessors to suggest the best improvements. The heuristic method requires a small group of evaluators [37]. In fact, heuristic evaluation is mainly based on ten main principles that were created by Nielsen and Molich in 1990 [35]. Figure 2 lists the heuristic evaluation components:

Figure 2: Ten principles of the heuristic evaluation

D. Usability of the Government Websites

Recently, governments around the world use modern communication technologies, such as web-based applications, to provide easier, faster and more efficient access to and deliver good quality services and information to the public38. Therefore, thousands of the systems that belong to the government across the world are accessible by the Internet and offer a variety of online government information and services [39]. However, according to Huang and Benyoucef [40] generating greater user engagement that translates into service utilisation, information access, and participation in government decision making remains a challenge.

Clemmensen and Katre [41] confirmed that usability is considered as a critical issue that affects to accept or use the government portal by citizens and that also influences the interaction between citizens and e-government portal. In addition, Wathen and Burkell [42] stated that failure to create an appropriate usable website might change users' attitude, consequently will reduce their satisfaction, and also raise their concerns about the access and use the services and information offered on such websites. Moreover, Heeks [9] referred that the failure rate of e-government systems is very high, the reason behind this failure because there is a gap between the design and reality.

Based on the abovementioned arguments, usability is deemed an essential element in the success of government websites. On top of that, Zappen, Harrison and Watson [43] affirmed that developing websites for any government level (whether federal, local and state) need to account for usability regarding user experience. The previous studies about the usability stated that the user experience is explicitly considered to be critically important. Table 2 lists the previous studies on evaluation of usability for government websites.

Table 2
Prior Literature of e-Government Usability

Author (s)	Year	Purpose of the study	Findings
Huang and Benyoucef	2014	This study sought to capture users' viewpoint of the usability and credibility for e-government website based on a heuristic evaluation. Also, this study tried to understand how usability and credibility impact each other.	The findings showed that high level of usability of electronic government portals would have higher credibility. The study also highlighted a several of usability problems related to an electronic portal.
Youngblood and Mackiewicz	2012	This study, which was based on the usability benchmarks, attempted to compare websites of the municipal government in Alabama.	Several issues were uncovered by this study, such as this study did not correlate with usability and number of population or per capita income. In addition, the study revealed substantial problems with municipal usability.
Lbayrak and Cagiltay,	2013	The key aim of this study was to investigate the usability of some Turkish e-government services.	The results indicated the usability problems encountered while using government services. Moreover, this study listed specific recommendations for improvement of e-government services in Turkey.

With regard to the e-portal in Iraq, it aims to improve access to and also the delivery of government services for the benefit of the citizens. The problem of usability is deemed as one of the reasons for underused the government portal. Figure 3 shows the interface of the e-portal in Iraq. Regrettably, only one study conducted on the e-government website in Iraq focused on the usability aspect, although this study concentrates on the usability of this website based on the literature review and comparison with other e-government websites.

Figure 3: e-Portal (Citizen e-government) in Iraq

In 2015, Abdul-Wahid [11] conducted a study about the e-portal in Iraq. In his study, he compared the functions that are available in the e-government website with other e-government portals. However, this study only depended on secondary data (literature review and website for different countries) and did not concentrate on the citizens' perceptions, while most of the usability experts asserted on the importance of reflecting the users' viewpoint of the usability of websites. Nevertheless, Abdul-Wahid's study revealed many usability problems in e-portal, and he recommended to enhance or change the current government website.

As for user perspective and its importance to the success of e-government websites, De Róiste [44] stated that the success of e-government websites ultimately depends on users' viewpoint. De Róiste further added that participation of real users in the evaluation of e-government would very likely reflect the actual use and demand. For this purpose, the present study is based on heuristic evaluation and users' perceptions and strives to shed light on the usability problems in the e-portal in Iraq.

IV. METHOD

In this empirical study, e-portal in Iraq has been selected based on the arguments that have been previously discussed. Meanwhile, the sample will be selected from the Iraqi students in Universiti Utara Malaysia.

According to Khajouei, Hasman and Jaspers [45] and Sonderegger and Sauer46, there are several techniques or methods to usability inspections, these methods include heuristic evaluation, cognitive walkthrough, and user testing. Among those techniques, heuristic evaluation is easier, quicker and more effective and has been broadly used in various studies as stated by Youngblood and Mackiewicz [12].

Furthermore, heuristic evaluation can capture a high proportion of issues related to the website usability6. For instance, Tan, Liu, and Bishu [47] used the user testing and heuristic evaluation to explore website or system design problems, and out of a total of 183 problems, heuristic evaluation identified 150, while user testing only detected [69]. Moreover, heuristic evaluation can be used for in-depth inspections as in Garcia, Maciel and Pinto [48] who used it to assess Brazilian e-government websites. Thus, based on the usefulness of heuristic evaluation approach above-mentioned, it will be more helpful to exploit it in this study to evaluate the usability of the e-portal website.

V. EMPIRICAL STUDY

Usability research is very important, and it provides essential information about users' standpoint on efficiency, effectiveness, and satisfaction of given online services. Of late, e-government websites have become popular. Consequently, there is a need for usability testing to determine usability problems and to make the services of the e-government more usable. In this part, testing of the e-portal will be conducted with three users (Iraqi students in UUM) who have good experience with web design to explore and investigate the usability problems based on heuristic technique.

In fact, the reason for selecting the ten Nielsen's principles is that it can be implemented conveniently and quickly through a competent pool of evaluators. Furthermore, heuristics evaluation can be done to assess the interface design specifically and generally to identify setbacks found in the portal interface. For this study, a questionnaire will be designed based on Nielsen's ten heuristics and conducted across a sampling of Iraqi postgraduate and undergraduate students in UUM.

In this empirical study, the evaluators were provided with scenarios and specific tasks to perform the evaluation. This will allow evaluators to have the freedom to browse any of the pages in the e-portal website and then conduct the required tasks. Also, in this manner, the evaluators can perform any task that they have in mind. The testers made each evaluator browse the website pages twice: the first time, the evaluators familiarise themselves with the website interface by carrying out several tasks, while the second time, the evaluators inspect the critical problem based on the particular questionnaire related to the list of the heuristic evaluation method. Evaluators must answer the questionnaires either "Yes", "No", or "Not Applicable". Furthermore, the evaluators are required to write the overall comments. More precisely, several tasks conducted by the evaluators (such as searching for higher ministry link, downloading the passport form, opening the educational ministry website, sending the query for the administration of the website, and searching the email and phone of the defence ministry).

VI. DATA ANALYSIS AND FINDINGS

After getting the answers from the evaluators for each heuristic element, the tester rated the heuristics principles according to their severity. Many researchers have exploited this technique. The comments from the evaluators are considered helpful in identifying usability principles problems and in explaining the usability problems identified. Principle 3 is the highest level and then followed by principle 8, while principle 5 and 7 are in the bottom.

In the same context, the second student asserted there is a weakness in the heuristic seven and five. The results show the percentage of the heuristic 5 was 42% and heuristic seven was 33%. In contrast, heuristic 3 was 73%, and heuristic 8 was 70%.

Based on the results from student 2, this means that the developers have given more attention to design than the content. The third student also ensures to enhance the design of the error messages, and the information must be visible or more easily retrievable to the user. Also, such e-portal is not available by any means for persons with disabilities to access the useful information. In fact, the results indicate that there is the diversity of the ten heuristics. The e-portal website has a good design for the interface, but many vital functions that are necessary for the users have been ignored. With regard to student 4, the heuristic 1, 3 and 8 applied on this website have a high percentage, where heuristic 1 was 71%, heuristic 3 was 76%, and heuristic 8 was 73 %. While, the five and six students also asserted to enhance the design of the e-portal, and all functions must be available for the most significant number of users.

The results of this empirical study calculated only the answers of "Yes" and "No". After the testers have gotten the statistics of the answers, the severity rating of each violation of the principles on a five-point scale has been assigned. Each heuristic was rated on a scale of 0 to 4, as follows:

- Scale 0: Totally disagree that this is a usability problem.
- Scale 1: Cosmetic problem only (not important to fix it).
- Scale 2: Minor usability problem (only be given low priority).
- Scale 3: Major usability problem (important to fix it, therefore should be given high priority).
- Scale 4: Usability catastrophe (very serious problem and should be fixed immediately).
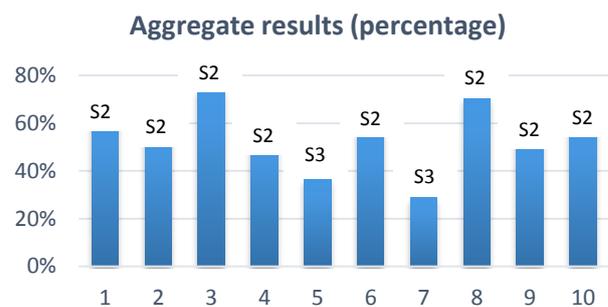
Figure 4: Analysis of results and severity rating

VII. CONCLUSION

The e-government portal has become one of the major foundations in new modern society. Thousands of e-government systems are accessible via the internet, and they offer a variety of online government information and services. With this steady growth of e-government portal, the prior work has noted the importance of service design to the success of services. Encouraging the citizens to engage in and interact with the e-government services remains a challenge for many countries. Usability is among the reasons for that challenge because they affect citizens' usage and acceptance of e-government portal and influence their day-to-day interaction with e-portal. Consequently, the main goal of the present study is to evaluate the usability of the Iraqi e-portal through heuristic evaluation approach and students' perspective.

From the heuristic evaluation, the answers given by six students who have good experience in design websites were collected and analysed. The summarised results are shown in Table 12. Eight heuristics (No. 1, 2,3,4,6, 8, and 10) were rated as scale 2: minor usability problem and two heuristics (heuristic No. 5 and 7) were rated as scale 3: significant usability problem. In the future work, more studies on the usability of the government website whether in the local or

state level are needed. Furthermore, different methods for assessing the usability of the website based on the users' perception should be harnessed.

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