

e-Government Usability Evaluation: A Comparison between Algeria and the UK

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Abstract—e-Government holds the keys to improving government services provided to citizens and the private sectors within their countries. Although Algeria is the largest country in Africa and has one of the most thriving economies in the continent, it is remarkable that the Algerian EGDI ranking was 120th according to the latest UN e-government survey. This inspired the researcher to investigate the relationship between the success factors of e-services in developed countries and their counterparts in developing countries. The main aim of this study is to explore the factors that influence the level of usability of e-government services between developing and developed countries against a set of specific guidelines to provide means for improving these services in developing countries. The researcher selectively extracted three guideline categories from Research-Based Web Design and Usability Guidelines as a means for expert evaluation of 10 Algerian e-government services compared to British e-government services. Our results show that Algerian e-services lack mostly in Use Frames when Functions Must Remain Accessible, Highlighting Information, and Graphics Should Not Look like Banner Ads (belonging to Page Layout, Text Appearance, and Graphics, Images & Multimedia respectively), whereas UK e-services scored highly across all three categories. These findings further enhance the UN e-government survey and identifies the sub-categories that developing countries need to pay more attention to in order to provide a more reliable and robust e-service to its users and citizens. Furthermore, this study proposes that the Research-Based Web Design & Usability Guidelines can be converted into an evaluation tool to be used by evaluators to easily assess the usability of a website. The combination of relative importance, chapters of the guidelines, and their respective guidelines gathered from Research-Based Web Design & Usability Guidelines, along with the evaluation of these individual guidelines by evaluators will serve as an integral tool for developers when developing e-government services to reach the satisfaction of the users.

Keywords— *Human computer interaction; usability evaluation; web design; e-Government; user satisfaction*

I. INTRODUCTION

The internet officially launched in Algeria in 2001, Seven years later in 2008, e-government services in Algeria were established [1]. Only recently has the Algerian government tried to keep up with modern technology by using online services. However, the shift from centralisation to using electronic services has not been an easy process. Design, logistics infrastructure, internet speed, and adoption of new services; are all factors that are considered great challenges facing the government as it moves into the world of electronic services. Like other governments in developing countries, the

Algerian government seeks to establish an electronic system through which citizens can benefit from the e-services provided by their government in various fields. However, the e-government project encountered many problems regarding infrastructure, use of technology in a sound manner, the quality of services, and ease of access for citizens. The ultimate aim of e-governments is to improve the usability of their services for their users, thus increasing user interaction. There are several definitions of e-government based on its use, however this research focuses on e-government as a system rather than from a technical or social aspect. One definition describes e-government as "the use of information technology to enable and improve the efficiency of government-provided services to citizens, employees, businesses and agencies" [2]. Most governments in developing countries have recently engaged in e-services that aim to conserve effort, time, and money for the population. Many various usability guidelines exist today (such as ISO/CD 9241-151). Thus, it is hard to point out one guideline as the model since every audience around the world has its own culture, background, symbols, language, and political system [3]. Furthermore, the level of the country's economy affects their perception and judgments of everything around them, and therefore each audience has different needs [4], [5].

This study decided to utilise the Research-Based Web Design & Usability Guidelines (RBED&UG) due to its exclusivity and popularity in government agencies, educational programs, and various independent sectors. These guidelines were established by the U.S. Department of Health and Human Services initially in 2003 and further developed in 2006 with the aim of helping designers develop a large range of websites, but mainly information filled government services. The exclusivity of these guidelines lies in their relative importance in rankings whilst also providing references and expert feedback to support their argument. Another reason this study decided to use guidelines is due to the recommendations provided by the authors of these guidelines, which motivates researchers to explore avenues with little or almost no research, as is the case is with Algerian e-government. The latest edition is made up of 18 main chapters, which are divided into multiple guidelines enhanced by the relative importance and strength of evidence providing a total of 209 guidelines across these chapters [6]. This research focused on three chapters of this guideline (Page Layout, Text Appearance, and Graphics, Multimedia, & Images) as it aimed to provide accurate and in-depth results rather than a broad and general set of results which may not be as useful to the web designers of these websites.

The main reasons for picking Algerian e-government services as the subject of this study is that there is a lack of research in this field regarding less developed countries generally [7], and according to our knowledge, even after more than a decade since its establishment, there are no studies that analyse the usability of e-government services in Algeria. Furthermore, this simultaneously fulfils the recommendations of the authors of the RBED&UG of researching into new areas and providing relevant research results. Therefore, the main contribution of this research is that it is the first study to shed light on the usability of Algerian e-government services and provide web designers with a deep insight into how to address the flaws (lack of online services, lack of visual consistency, etc.) which the experts in this study have identified in order to help the government create usable, learnable, and effective e-services that will increase user interaction.

The e-government development index (EGDI) measures a country's capability to deliver online public services and is calculated using three variables including telecommunications infrastructure index (TII), human capital index (HCI), and online service index (OSI). This study compares the Algerian government e-services with the government e-services in the United Kingdom, as Britain is a developed country and ranks high in the EGDI rankings published in the latest United Nations e-government survey so that a comparison can be made between Algeria as a developing country and Britain as a developed country, allowing for better understanding of deficiencies and focusing on the factors that are likely to have an impact on improving the quality of service provided to citizens in developing countries, which facilitates the lives of citizens and makes them more efficient and of better quality. The British are 7th in the EGDI rankings whereas Algeria is ranked 120th in the world [8]. The aim is to explore why there are such big gaps in the e-services provided between developed and less developed countries. Unlike the British e-government services which are all available on one website, Algerian e-government services are all independent and each website serves a different purpose, for example, the ministry of interior, the ministry of sports etc. Therefore, this study selected ten Algerian e-government websites to compare with the British e-government website to serve as a realistic representation of Algerian e-services. The null hypothesis in this study is that there is no significant difference between Algerian and British e-government services, whereas the alternative hypothesis states that there is a significant difference between Algerian and British e-government services.

Another contribution of this study is that it converts the RBED&UG into a questionnaire to be used by web designers to help evaluate and gather relevant data for improving electronic web services. Researchers realised the importance of these guidelines in developing and initiating web systems in various fields and the high potential that it can be used by web designers for evaluating the level of a system and addressing certain issues that may present. Researchers believe that the same concept of converting guidelines into a questionnaire to be used as an evaluating tool for web designers can be implemented with any of the chapters of the RBED&UG. The study only used three chapters as a representative of all

chapters and to show that it can indeed be implemented efficiently and effectively to good use.

This research paper is split into six parts including the introduction which provides an overview of the main components of this research. Then, the literature review dwells on previous research and identifies their key findings and shortcomings which need to be addressed. The methodology details the stages of this research and the demographic data of the participants that were involved. Results and discussion include a detailed analysis which breaks down the various attributes that are suffering or excelling in the usability of e-government services. The conclusion provides an overview of our research along with the main results and contributions it brings forward to the domain of e-government usability. Finally, the limitations and future work marks the end of this research paper.

II. LITERATURE REVIEW

Information technology is growing rapidly; government services must also be up to date with these technological advancements. In developing countries, this challenge is far greater, since many still suffer from poor IT infrastructure and financial problems, which hinder their progress in providing advanced electronic services to their citizens. Besides, building trust between the citizens and using electronic services is still in development [9]. This section discusses e-government websites and usability, usability evaluation methods and e-governments Algerian websites.

A. e-Government Websites and Usability

In the last decade, e-government services have become more important than ever before. Many governments have launched at least one or more systems that provide citizens with the necessary information and adequate services. It summarises and stores relevant information based on the quality of the internet and the level of ability of the users to use their internet services. Many factors can affect the performance of these e-government systems such as the educational background of the users, culture, and simplicity of the system, efficiency, robustness and reliability [3]. There are various definitions of e-government depending on the field of interest and the perception of experts [10]. The World Bank (2015) believes that "E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government" [11]. However, a comprehensive study on multiple definitions of e-government established six main elements that serve as a widely shared definition. These variables consist of; "(1) the major initiatives of management and delivery of information and public services. (2) Taken by all levels of governments (including agencies and sectors). (3) On behalf of citizens, business. (4) Involving using multi-ways of internet, web site, system integration, and interoperability. (5) To enhance the services (information, communication, policy making), quality and security. (6) As a new key (main, important) strategy or approach" [10].

Usability is defined by the ISO as the "extent to which a system, product or service can be used by specified users to

achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” [12]. Any new system or product should achieve its goals and satisfy its end users by ensuring that the system is more interactive and attractive to maximise the benefits of the system. Most e-government projects (35% total failures and 50% partial failures) in less developed countries are unsuccessful [7]. They are unable to fulfil the satisfaction of their users due to the widespread usability issues found on their systems [13]. Nielsen’s description of usability via the implementation of various metrics is widely accepted, thus ten usability guidelines were initiated to identify errors, evaluate the level of effectiveness and efficiency and establish user control, thus, ultimately fulfilling user satisfaction.[3].

Some studies [14] argue that e-government can benefit from usability in two aspects; satisfaction is key due to improved user performance on e-government services, on the other hand, the first impressions are also crucial for attracting users to using e-government online services. e-Government relates to usability in multiple ways correlating to satisfaction; internet speeds [15] loading speed [16] usefulness and ease of use [17]. The abovementioned variables are one of the most influential in the usability of e-government according to previous studies. Poor design interface can affect not only the perception of users, but in some cases can become more serious and influence various factors such as user safety [18]. Therefore, users should be an essential part in the design stages to minimise the errors that end users can face [7] explore the value of e-government and the public value it holds. Through this research, six values were identified; Open Government capabilities, improved ethical behaviour and professionalism, improved public services, improved administrative efficiency, improved social value and well-being, and improved trust and confidence in government. In least developed countries and developing countries, there was a lack of research in attempting to figure out the public value of e-government and the user perception of these services.

Many studies in other countries have attempted to figure out solutions and identify factors that can influence the quality and usability of e-governments services. Studies have shown that usability is the heart of an e-government system that attempts to fulfil the satisfaction of its users. Furthermore, it can directly affect the trust of the users [19]. The meaning of usability may not be clear enough. However, usability is not just how to make the system easy to use; instead, it is the ease of use based on efficiency, effectiveness, learnability, and user satisfaction [20]. Some studies argue that western e-government websites fail to deliver services to their citizens [21]. There were several usability issues identified in developing countries such as Jordan [22], Malaysia [23], China [24], and Sub-Saharan Africa [25] such as South Africa [26] and Tanzania [27]. The usability problems identified included accessibility [28] poor design [29] learnability [30] and text appearance [31]. Furthermore, poor usability design affects the quality of the website and the adoption of users, which drives them away from revisiting the website [5].

Each country faces its own specific usability issues, and many studies have found different factors that can positively or negatively evaluate the level of e-government services and the

quality provided to their citizens. e-Government services in Mauritius Island showed that factors like expected performance and facilitating conditions have a positive relationship with the users' behavioural intentions. On the other hand, computer self-efficacy is negatively related to the users' behavioural intentions. The authors suggest essential steps the government could take to help the citizens adopt their e-government services effectively and efficiently [32]. In Turkey, factors that could help citizens adopt e-government services are Performance Expectancy, Social Influence, Facilitating Conditions, and Trust on the Internet. Authors [33] have initiated a new guideline for policymakers to initiate attractive e-government services by considering the highlighted priorities of the citizens. The authors proposed a new analysis technique that could potentially increase and maximise e-government portals' potential to benefit individuals from various cultural backgrounds. This analysis technique incorporates various factors such as content analysis, user perception, and persuasive quality gap. Culture is another factor that can affect the usability satisfaction level [34], [16]. For example, [35] argue that their suggested approach provides an estimation method to measure the contribution of e-government quality attribute to cross-cultural quality gap. They also examine the satisfaction level of Jordanian citizens when using these e-government services. Several factors influencing satisfaction were identified; security and privacy, trust, accessibility, awareness, and quality. They claim that their findings have proven very useful for industry practitioners and policymakers within the government.

B. Usability Evaluation Methods

Usability evaluation becomes more crucial in testing usability issues including content and page layout, to create a system that suits the requirements of the user and meets their needs. There are two main usability evaluation methods used to assess usability websites: heuristic evaluation and usability testing.

Many studies use this type of evaluation (see Table I) via Nielsen’s ten heuristics due to its low cost, time efficiency, and how it requires only a few experts to give their opinion about the problems that face certain applications or websites. On the other hand, “usability testing refers to evaluating a product or service by testing it with representative users” [36]. Usability testing gathers a group of users to complete several tasks on the system to assess the usability level and identify any issues within it. The users assessing the system are the same users that the designer is creating a usable system for, thus any issues identified by these participants are crucial and provide a real-life representation of the end user feedback after the official launch of the system. Consequently, designers can take their feedback on board and make the appropriate adjustments to improve the overall system to make it more usable and attractive. For these reasons, this study proposes that the new questionnaire is to be used as a heuristic evaluation method used by evaluators in web design.

TABLE I. PREVIOUS STUDIES OF USABILITY EVALUATION METHODS

Study	Method	Type
Fonseca and Peñalvo (2019) [37]	Usability testing	Gaming
Huang and Chen (2019) [38]	Usability testing	Digital learning environments
Fuller-Tyszkiewicz et al (2018) [39]	Usability testing	Health app
Krzewińska et al (2018) [40]	Usability testing	Web systems
De Souza Filho et al (2017) [41]	Collaborative heuristic evaluation	Gaming
Diaz et al (2017) [42]	Heuristic Evaluation	e-Commerce
Jucá et al (2017) [43]	Heuristic Evaluation	Gaming
Alhadreti and Mayhew (2017) [44]	Usability testing	Examine think-aloud methods
Murillo et al (2017) [45]	Usability testing and Heuristic Evaluation	Web-based systems
Atashi et al (2016) [46]	Heuristic Evaluation	User Interface
Falkowska et al (2016) [47]	Usability testing (Eye Tracking)	Web applications
Inostroza et al (2015) [48]	Heuristic Evaluation	Smartphones and application
Chynał and Sobecki (2015) [49]	Usability testing	User Interface
Bezerra et al (2014) [50]	Usability testing	Ubiquitous systems
Ko et al (2013) [51]	Heuristic Evaluation	Mobile app
Boothe et al (2013) [52]	Usability testing	Interface medium
Sivaji et al (2011) [53]	Heuristic Evaluation	e-Government websites
Thyvalikakath (2009) [54]	Usability testing and Heuristic Evaluation	Comparison study
Garcia et al (2005) [55]	Heuristic Evaluation	e-Government

III. METHODOLOGY

A. e-Services Evaluated

Ten Algerian e-Government websites were selected for evaluation in this study. They include the following: Minister of Defence, Minister of Interior and Local Government, Minister of Foreign Affairs, Minister of Finance, Minister of Energy, Minister of War Veterans (Moudjahidine), Minister of Religious Affairs and Endowments (Wakfs), Minister of Vocational Education and Training Professionals, Ministry of Culture and Arts, and Minister of National Solidarity, Family and Women's Affairs. There is no unified website in Algeria that can provide more government electronic services, so the researcher had to collect the ten most used Algerian websites to evaluate electronic government services, while in the United Kingdom there is only one website that collects government

electronic services, and accordingly, a comparison was made between these ten sites. After this information was evaluated by experts, the average was collected from each of the ten sites and compared with the standard British site in order to facilitate the evaluation process.

B. Proposed Usability Questionnaire Model

After realising the effectiveness of the RBED&UG, researchers believed that these guidelines could be effectively used during usability of e-government services to identify flaws within the usability of these systems. Whilst guidelines are used by web designers when creating a web page, researchers propose that the RBED&UG is transformed and used as a questionnaire to evaluate the system after it is created so that web designers can brush up and improve on the areas that are lacking thus providing a more robust and reliable service. This study decided to selectively examine the effectiveness of three chapters (Page Layout, Text Appearance, Graphics, Images & Multimedia) from the RBED&UG to serve as a strong representative for the other 15 chapters. Since the original guidelines follow a five-point scale, researchers believed it would be most appropriate to be consistent and implement a five-point scale in the questionnaire where one represents "very poor" to five which represents "very strong". Tables II, III and IV display the questionnaires that were provided to the experts before the start of the experiment. They were provided with two copies of each one, totalling to six copies of these questionnaires to evaluate both Algerian and British e-Government services relative to the three selected guidelines. The experts marked their selected scores for the relative e-service and guidelines of these categories. These results will be collated by the researcher at the end of their evaluation and utilised for statistical analysis of the data.

TABLE II. TABLE TYPE STYLES

Usability Page Layout Questionnaire					
	1	2	3	4	5
1. Avoid Cluttered Displays					
2. Place Important Items Consistently					
3. Place Important Items at Top Centre					
4. Structure for Easy Comparison					
5. Establish Level of Importance					
6. Optimize Display Density					
7. Align Items on a Page					
8. Use Fluid Layouts					
9. Avoid Scroll Stoppers					
10. Set Appropriate Page Lengths					
11. Use Moderate White Space					
12. Choose Appropriate Line Lengths					
13. Use Frames when Functions Must Remain Accessible					

TABLE III. USABILITY TEXT APPEARANCE QUESTIONNAIRE

Usability Text Appearance Questionnaire					
	1	2	3	4	5
1. Use Black Text on Plain, High-Contrast Backgrounds					
2. Format Common Items Consistently					
3. Use Mixed-Case for Prose Text					
4. Ensure Visual Consistency					
5. Use Bold Text Sparingly					
6. Use Attention-Attracting Features when Appropriate					
7. Use Familiar Fonts					
8. Use at Least 12-Point Font					
9. Color-Coding and Instructions					
10. Emphasize Importance					
11. Highlighting Information					

TABLE IV. USABILITY GRAPHICS, IMAGES, & MULTIMEDIA QUESTIONNAIRE

Usability Graphics, Images, & Multimedia Questionnaire					
	1	2	3	4	5
1. Use Simple Background Images					
2. Label Clickable Images					
3. Ensure that Images Do Not Slow Downloads					
4. Use Video, Animation, and Audio Meaningfully					
5. Include Logos					
6. Graphics Should Not Look like Banner Ads					
7. Limit Large Images Above the Fold					
8. Ensure Web Site Images Convey Intended Messages					
9. Limit the Use of Images					
10. Include Actual Data with Data Graphics					
11. Display Monitoring Information Graphically					

12. Introduce Animation					
13. Emulate Real-World Objects					
14. Use Thumbnail Images to Preview Larger Images					
15. Use Images to Facilitate Learning					
16. Using Photographs of People					

C. Procedure

The volunteering experts were provided with all the websites required for this experiment and a brief was given before the beginning of the evaluation process along with copies of the questionnaires they would have to fill out. The brief very simply explained the goals of our research and that the participants are testing the guidelines as a questionnaire for evaluation to explore the issues in Algerian and British e-Government websites. The results would also simultaneously help assess the validity of the proposed questionnaire. The researcher decided to allocate some time for the experts before evaluation to get familiar with these e-services so that they can easily and effectively evaluate them once the process begins. After that the experts evaluated the e-services according to the three dimensions (Page Layout, Text Appearance, and Graphics, Images, & Multimedia) from our usability questionnaire accordingly, freely with no time constraints. Experts were asked to return the questionnaire once complete.

D. Participants

Since some e-services are only available in English, Arabic, or French, the researcher decided to select seven experts who are confident with all three languages to help gather the results of our study across all platforms with no issues and full understanding. Each expert evaluated the ten selected Algerian e-Government websites and the British e-Government website. The participants who contributed to this research voluntarily are from different educational levels and gender backgrounds. Most participating experts were males aged between 36 and 50 years who are of a postgraduate degree status. Table V shows the expert demographics.

TABLE V. EXPERT DEMOGRAPHICS

Demographic	Category	Number of Participants (7)	%
Age	25-35	1	14
	36-50	4	57
	50+	2	29
Gender	Women	2	29
	Men	5	71
Education Level	Undergraduate Degree	2	29
	Postgraduate Degree	5	71

E. SPSS Analysis

The results of the expert evaluation gathered via the proposed questionnaire were inserted into the SPSS program and results of importance to this study were extracted such as the paired samples statistics mean and standard deviation, the paired samples test mean and standard deviation, t-values, and p-values. The paired samples statistics mean shows us the average score for each guideline of each chapter, whereas the paired samples statistics standard deviation uses the results of the experts to identify the level of consensus between the set of results. The paired samples test mean is the difference between the paired samples statistics mean of the two tested variables. Furthermore, the p values show us the level of significant differences between our tested samples in each element of the three categories selected. For the data to be considered significantly different, the value of p must be less than 0.05, thus rejecting the null hypothesis which in this study is that there is no difference between the Algerian and British e-Government services, therefore the alternative hypothesis would be accepted instead. However, if the value of p is greater than 0.05, then the data is deemed to be insignificantly different, and the null hypothesis is accepted. This analytical technique helps researchers identify where the main flaws lie in a certain set of data, and in this case, it shows us which guideline suffers the most in the usability of Algerian and British e-Services and where the biggest difference lies between the two.

IV. RESULTS AND DISCUSSION

Experts evaluated Algerian and British e-Government services via our proposed questionnaire derived from the three categories of the RBED&UG. The results of each of the seven experts were gathered and inserted into the statistical software SPSS. This software provided us with some important data which will be analysed later on. As expected from the results, the British e-Government services scored higher across all three categories overall as seen in Fig. 1. The Algerian e-Government services scored 2.748, in contrast to the British e-Government services which scored 4.758 in the Page Layout category. For Text Appearance, the scores for the Algerian and British e-services were 2.785 and 4.562 respectively. Finally, in the Graphics, Images & Multimedia, the results followed a similar pattern, where the Algerian e-Government services were inferior to the British services (2.594 and 4.143 respectively), however this category suffered the most compared to the other two categories. Furthermore, each category will be discussed independently later on, and an in-depth analysis will be provided. The null hypothesis and alternative hypothesis will be accepted or rejected relevantly in each of the three categories.

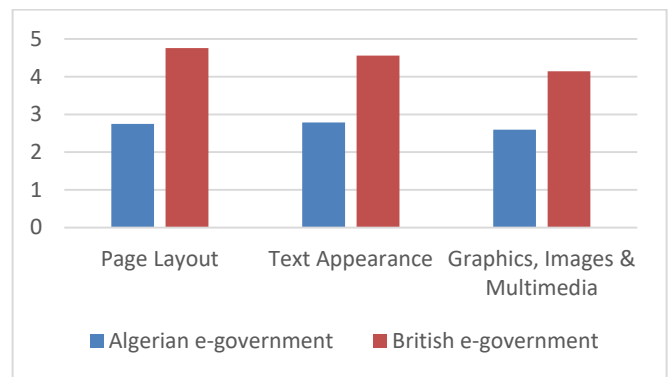


Fig. 1. Chart comparing the mean results of Algerian and British e-Government services across the three selected categories of the RBED&UG

A. Page Layout

Page layout is the main factor in the user interface; it outlines the position of elements and their dimensions [56]. The most important aspect when designing a page layout is to include necessary information only and to avoid overwhelming the user with unnecessary information that will only lead to confusion and over complication.

With the help of the SPSS software, the researcher was able to extract relevant information as seen in Table VI which presents all this data along with the 13 guidelines of Page Layout that are ranked according to relative importance according to the RBED&UG. The results show that all the guidelines of the Page Layout when comparing the Algerian and British services show significant differences due to the value of p being less than 0.05. Therefore, the British e-Government services according to the experts in this study are significantly different to the Algerian e-Government services. As a result, the null hypothesis for this study is rejected, and the alternative hypothesis is accepted. These results compliment the research conducted by the UN which displays the ranking difference regarding the EGDI, where Algeria falls behind the UK in every attribute of the page layout. Algeria must focus on the page layout as a whole, according to the relative importance of its guidelines to make sure that the most impactful factors of web usability are approached first. According to the experts, the two strongest attributes in the Algerian e-Government services include Establish Level of Importance and Choose Appropriate Line Lengths which both scored 3.571. On the other hand, the experts believed that Choose Appropriate Line Lengths (paired samples statistics mean = 4.929) was the strongest attribute of the British e-Government services. Furthermore, the two lowest scored variables in this section for the Algerian e-Government services include Use Frames when Functions Must Remain

Accessible and Use Moderate White Space which scored 2.429 and 2.500 respectively. Whereas, for the British e-Services, the lowest scored guidelines include Use Frames when Functions Must Remain Accessible and Establish Level of Importance (3.356 and 4.429, respectively). The two highest scoring categories of paired samples test mean values are Structure for Easy Comparison and Use Moderate White Space (both scored -2.143). This variable represents the difference in the level of guidelines between the Algerian and British e-services as identified by the experts. Therefore, this result shows that the biggest difference between the two tested subjects in this study lie in the two abovementioned sections of Page Layout. These results display the areas that require the most attention whilst also simultaneously adhering to the level of importance of these factors to prioritise the level of importance needed to identify which attributes must be first approached or approached with the most attention.

TABLE VI. RESULTS OF THE SPSS ANALYSIS FOR PAGE LAYOUT

Page Layout				
Guidelines	Relative Importance	Paired Samples Statistics Mean (SD) Algerian e-Government & British e-Government	Paired Samples Test Mean (SD)	Significance
1. Avoid Cluttered Displays	5	2.714 (0.184)	-1.929 (0.787)	t=-6.485 p=0.001
		4.642 (0.143)		
2. Place Important Items Consistently	5	3.071 (0.202)	-1.571 (0.731)	t=-5.680 p=0.001
		4.642 (0.180)		
3. Place Important Items at Top Centre	5	2.790 (0.184)	-1.786 (0.756)	t=-6.250 p=0.001
		4.571 (0.170)		
4. Structure for Easy Comparison	4	2.571 (0.202)	-2.143 (0.556)	t=-10.190 p=0.000
		4.715 (0.184)		
5. Establish Level of Importance	4	3.571 (0.170)	-0.857 (0.610)	t=-3.286 p=0.017
		4.429 (0.170)		
6. Optimize Display Density	4	3.286 (0.214)	-1.000 (0.764)	t=-3.464 p=0.013
		4.786 (0.149)		
7. Align Items on a Page	4	2.642(0.180)	-2.143 (0.627)	t=-9.045 p=0.000
		4.786(0.149)		
8. Use Fluid Layouts	3	2.714 (0.240)	-2.000 (0.707)	t=-7.483 p=0.000
		4.714 (0.149)		
9. Avoid Scroll	3	2.857 (0.922)	-1.929	t=-27.000

Stoppers		4.786 (0.149)	(0.189)	p=0.000
10. Set Appropriate Page Lengths	3	2.929 (0.202)	-2.000 (0.646)	t=-8.198 p=0.000
		4.929 (0.714)		
11. Use Moderate White Space	3	2.500 (0.110)	-2.143 (0.378)	t=-15.000 p=0.000
		4.643 (0.180)		
12. Choose Appropriate Line Lengths	2	3.571 (0.202)	-1.357 (0.690)	t=-5.203 p=0.002
		4.929 (0.714)		
13. Use Frames when Functions Must Remain Accessible	1	2.429 (0.130)	-0.929 (0.838)	t=-2.931 p=0.026
		3.356 (0.340)		

B. Text Appearance

Text is the backbone of any website as it expresses and infers a lot about the website whilst also playing a major role in user satisfaction [57]. Therefore, designers must pay more attention to the main points that affect web design usability [58]. Designers must also research the location of their target audience and study their culture as each culture's needs differ [3]. Therefore, further investigation into the level of infrastructures and the level of user adoption must be undergone. Consequently, creating a website with the appropriate font, font size etc. will allow users to become more comfortable while effectively surfing the website. Consistency, and the level of the quality attributes of the content, which include understandability, relevance, accuracy and finally coverage, should also be focused on accordingly as it is crucial when evaluating the usability of text appearance [59], [60].

Table VII which presents the results of the SPSS analysis for Text Appearance also rejects the null hypothesis of this research as none of the p values of its relative guidelines appeared to be greater than 0.05. The analysis also shows that the Algerian e-services matched the British e-services in one category (Emphasis Importance) which holds a relative importance of 2 according to the RBED&UG. The paired samples statistics mean simply represents the average score of all seven experts in their assessment of the level of the attributes within the websites. The results show that for the Algerian e-Government services, use at Least 12-Point Font (4.357) and Use Similar Fonts (4.071) scored the highest. Whereas, for the British e-Government services, the experts believed that Ensure Visual Consistency and Highlighting Information were the strongest attributes of this category, as all experts unanimously agreed to their perfect score of five. On the contrary, the lowest scoring factors of Text Appearance regarding the Algerian e-services belonged to Highlighting Information (1.856) and Use Attention-Attracting Features when Appropriate (2.071). The experts believed that for the British e-Services, the weakest score belonged to Emphasize

Importance (2.786). In addition, the two highest scoring guidelines regarding the paired samples test mean are Highlighting Information and Ensure Visual Consistency, where they scored -3.143 and -2.857, respectively.

TABLE VII. RESULTS OF THE SPSS ANALYSIS FOR TEXT APPEARANCE

Text Appearance				
Guidelines	Relative Importance	Paired Samples Statistics Mean (SD) Algerian e-Government & British e-Government	Paired Samples Test Mean (SD)	Significance
1. Use Black Text on Plain, High-Contrast Backgrounds	4	2.142 (0.210)	-2.143 (0.801)	t= -7.071 p=0.000
		4.186 (0.149)		
2. Format Common Items Consistently	4	2.714 (0.240)	-2.143 (0.748)	t=-7.579 p=0.000
		4.857 (0.092)		
3. Use Mixed-Case for Prose Text	4	3.714 (0.101)	-0.714 (0.636)	t=-2.970 p=0.000
		4.429 (0.170)		
4. Ensure Visual Consistency	4	2.143 (0.210)	-2.857 (0.556)	t= -13.587 p=0.000
		5.000 (0.000)		
5. Use Bold Text Sparingly	3	2.286 (0.184)	-2.714 (0.488)	t=-14.717 p=0.003
		5.000 (0.000)		
6. Use Attention-Attracting Features when Appropriate	3	2.071 (0.202)	-2.429 (0.450)	t=-14.283 p=0.000
		4.500 (0.154)		
7. Use Familiar Fonts	3	4.071 (0.130)	-0.571 (0.535)	t=-2.828 p=0.000
		4.643 (0.143)		
8. Use at Least 12-Point Font	3	4.357 (0.922)	-0.429 (0.345)	t=-3.286 p=0.000
		4.786 (0.101)		
9. Color-Coding and Instructions	2	2.500 (0.154)	-2.500 (0.408)	t=-16.202 p=0.000
		5.000 (0.000)		
10. Emphasize Importance	2	2.786 (0.184)	-1.857 (0.748)	t=-6.569 p=0.011
		2.786 (0.184)		
11. Highlighting Information	2	1.856 (0.210)	-3.143 (0.556)	t=-14.946 p=0.000
		5.000 (0.000)		

C. Graphics, Images, and Multimedia

Graphics, Images & Multimedia was the densest category amongst the three tested in this study, as it contained a total of 16 guidelines. Graphics, images, and multimedia individually or collectively, play a major role in user interface design. The proper use of graphics can enhance the usability of websites [61]. Studies show that images are a crucial aspect when designing a website [5], [62]. Images also influence the interactive systems of enhancing the positive or negative reaction of the users of websites [63]. On the other hand, multimedia can attract more users and efficiently summarize the message that the designers and the website owners want to deliver to the users [64]. The designer should know the background of the target users to create a website that respects their culture and values [5]. Furthermore, the designer should look to get familiar with the internet speed of the target region, which will dictate the use or lack of graphics, images and multimedia as they can take a while to upload/download or may not upload/download if the internet speed is not enough or if the file is too big. Therefore, designers must ensure that all these factors are considered to avoid failing their target users and avoid providing them with an unattractive website that their internet connection speed is too slow to handle that may potentially disrespect their culture, which ultimately causes the whole website to fail. The abovementioned factors are crucial to the success of any website.

The results from this category (Table VIII) follow a similar pattern to the previous categories, where according to the experts; the British e-Services are a lot superior to the Algerian e-services. Across all guidelines, there is a significant difference between the two tested subjects. However, for Introduce Animation, the value of p is 0.726 which is greater than 0.05 which means that there is no significant difference between the Algerian and British e-Government services in relation to this guideline. Thus, for this category alone which has a relative importance of 2 according to the RBED&UG, the null hypothesis is accepted, and the alternative hypothesis is rejected. The strongest attributes according to the experts regarding the Algerian e-services are Using Photographs of People (4.429) and Include Logos (4.071), whereas the weakest attributes include Graphics Should Not Look like Banner Ads and Ensure Web Site Images Convey Intended Messages which both scored 1.643 according to the average rating of the experts. The Graphics Should Not Look like Banners guideline had the highest paired samples test mean (-3.357) amongst all guidelines of this category. Overall, the results of this category illustrate the shortcomings of the Algerian e-services and how they should approach each category according to its evaluated level by the experts and the relative importance determined by the guidelines.

TABLE VIII. RESULTS OF THE SPSS ANALYSIS FOR PAGE LAYOUT

Graphics, Images, and Multimedia				
Guidelines	Relative Importance	Paired Samples Statistics Mean (SD) Algerian e-Government & British e-Government	Paired Samples Test Mean (SD)	Significance
1. Use Simple Background Images	4	3.429 (0.202)	-1.285 (0.487)	t=-6.971 p=0.000
		4.714 (0.149)		
2. Label Clickable Images	4	2.286 (0.185)	-2.429 (0.535)	t=-12.021 p=0.000
		4.714 (0.101)		
3. Ensure that Images Do Not Slow Downloads	4	1.856 (0.261)	-3.071 (0.732)	t=-11.103 p=0.000
		4.929 (0.714)		
4. Use Video, Animation, and Audio Meaningfully	4	2.143(0.143)	-1.929 (0.535)	t= -9.546 p=0.000
		4.071 (0.170)		
5. Include Logos	4	4.071 (0.170)	-0.714 (0.394)	t=-4.804 p=0.003
		4.786 (0.101)		
6. Graphics Should Not Look like Banner Ads	4	1.643 (0.143)	-3.357 (0.378)	t=-23.500 p=0.000
		5.000(0.000)		
7. Limit Large Images Above the Fold	4	3.429(0.170)	-1.571 (0.450)	t=-9.242 p=0.000
		5.000 (0.000)		
8. Ensure Web Site Images Convey Intended Messages	4	1.643 (0.210)	-3.214 (0.636)	t=-13.367 p=0.000
		4.857 (0.092)		
9. Limit the Use of Images	3	2.214(0.149)	-2.786 (0.393)	t=-18.735 p=0.000
		5.000 (0.000)		
10. Include Actual Data with Data Graphics	3	3.786(0.184)	-0.929 (0.667)	t=-3.653 p=0.011
		4.714 (0.101)		
11. Display Monitoring Information Graphically	3	1.857 (0.210)	-2.857 (0.475)	t=-15.894 p=0.000
		4.714 (0.149)		

12. Introduce Animation	2	2.571(0.170)	-0.143 (1.029)	t=-3.67 p=0.726
		2.714 (0.240)		
13. Emulate Real-World Objects	2	2.286 (0.185)	-2.071 (0.607)	t=-9.021 p=0.000
		4.357 (0.143)		
14. Use Thumbnail Images to Preview Larger Images	2	1.857(0.210)	-0.786 (0.567)	t=-3.667 p=0.010
		2.642 (0.210)		
15. Use Images to Facilitate Learning	1	2.000 (0.218)	-3.000 (0.577)	t=-13.748 p=0.000
		5.000 (0.000)		
16. Using Photographs of People	1	4.429 (0.130)	2.642 (0.801)	t=8.721 p=0.000
		1.787 (0.1184)		

V. CONCLUSION

This study sheds light on e-government websites that provide electronic services which facilitate communication between government agencies and citizens. User satisfaction influences web design regardless of the domain, therefore their needs and expectations must be met by the developers. The main subject of this study is the Algerian e-Government which according to the UN has an EGDI Global Rank of 120. This rank was surprising for the researcher considering the population size, infrastructure, and economy of the largest country in Africa. Therefore, this study attempted to identify the reasons that may be rooted to the lack of success of Algerian e-Government services at a global level. For this reason, the UK which ranks 7th in the EGDI Global Rank was selected as the second test subject to serve as a comparative tool to help the researcher identify the underlying reasons for the underperformance of these services. However, this study had to decide on an evaluation tool to use to gather relevant data. Consequently, the researcher identified an ideal set of guidelines known as the RBED&UG which was selected in this study due to its exclusivity and popularity in government agencies as the domain of this topic is e-government usability. The interesting factor regarding these guidelines is that it provides relative importance to each guideline. The researcher was really interested by this feature as the researcher believes that the most impactful guidelines must be addressed before the less important ones. Although these guidelines are used as an evaluation when designing websites, the researcher identified the potential of this to be converted into a questionnaire that could be used by experts when evaluating a system. The complexity of certain aspects of these guidelines, or now proposed questionnaire, suggests that it is not appropriate to be evaluated by normal users, but instead by experts within the field. The researcher believes that this proposal can prove to be very effective as experts are able to rate the chapters and guidelines accordingly, thus the developers can really benefit from their evaluation. There are a total of 18 guidelines in RBED&UG; however, after thorough research and information

gathering, the researcher selected only three categories (Page Layout, Text Appearance, and Graphics, Images & Multimedia) due to their proven role in web usability. This research ultimately aims to explore the reasons that influence the usability of Algerian e-Government services via comparing it with UK e-Government services against a set of guidelines. The results were gathered after an experiment which constituted of an expert evaluation of the two selected systems via completing the proposed questionnaires handed out to them. Their results were inputted into SPSS which provided statistical analysis of the set of data. This data helped identify the mean values of each guideline, their standard deviation, and the significance value of each one. The results display the sheer difference in quality between the Algerian and British e-Government services across all three guideline categories. The three weakest guidelines of each chapter for the Algerian e-Government services include Use Frames when Functions Must Remain Accessible, Highlighting Information, and Graphics Should Not Look like Banner Ads (belonging to Page Layout, Text Appearance, and Graphics, Images & Multimedia respectively). The Algerian e-Government services representatives and developers should focus on these results and improve their systems according to the results of this research, giving most attention to the weakest areas as identified by this study whilst also paying attention to their relative importance. The combination of these two integral factors will help provide effectiveness and efficiency during the evaluation and development process of a system.

VI. LIMITATION AND FUTURE WORK

This study provides solutions specific to the three usability guideline sections researched. Therefore, there is an opportunity for further research to expand on the remaining 15 guidelines of the RBED&UG. In addition, only two countries were examined in this research.

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