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A Proposed Framework for Evaluating Websites of Sudan Government

(A Case Study of Websites Providing Services to the Public)

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(دراسة حالة مواقع خدمات الجمهور)

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فال تعالى :

(يُؤۡتِى ٱلۡحِكۡمَةَ مَن يَشَآءُۚ وَمَن يُؤۡتَ ٱلۡحِكۡمَةَ فَقَدۡ أُوتِىَ خَيۡرٗا كَثِيرٗاۗ وَمَا يَذَّكَّرُ إِلَّآ أُوْلُواْ ٱلۡأَلۡبَٰبِ)

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ABSTRACT

The Department of Economic and Social Affairs of the United Nations defined e-government as "*the use of ICTs to more effectively and efficiently deliver government services to citizens and businesses. It is the application of ICT in government operations, achieving public ends by digital means*". Sudan government entities provide a wide range of information and services in their websites to fulfil their customers' needs. In this research we gradually develop a framework for evaluating the websites of Sudan public authorities. The proposed framework consists of six evaluation criteria: Content; Design and Usability; Accessibility; Privacy; e-Service; and Citizen Engagement. The practical use of the framework is demonstrated by means of a case study, namely evaluating four websites of Sudan public authorities. The approach used in the case study includes the construction of an appropriate questionnaire for assessing the framework criteria. the case study provides some interesting results with regards to the shortcomings of Sudan public authority websites. Results indicate that most websites place emphasis firstly on the Accessibility and secondly on Design and Usability specially on page structure, and thirdly on the Content. In particular, all websites score very low in Privacy; e-Service; and Citizen Engagement criteria.

المستخلص

عرفت إدارة الشؤون الاقتصادية والاجتماعية في الأمم المتحدة الحكومة الإلكترونية بأنها "*استخدام تكنولوجيا المعلومات والاتصالات لتقديم الخدمات الحكومية بشكل أكثر فعالية وكفاءة للمواطنين والشركات. وتطبيق تكنولوجيا المعلومات والاتصالات في العمليات الحكومية ، وتوفير الخدمات العامة بالوسائل الرقمية* ". تقدم الحكومة السودانية مجموعة واسعة من المعلومات والخدمات في مواقعها على شبكة الإنترنت لتلبية احتياجات عملائها. في هذا البحث نطور بشكل تدريجي إطار عمل لتقييم المواقع الإلكترونية للسلطات الحكومية السودانية. يتكون الإطار المقترح من ستة معايير للتقييم: المحتوى؛ التصميم وسهولة الاستخدام ؛ إمكانية الوصول؛ الخصوصية؛ الخدمات الإلكترونية ؛ ومشاركة المواطنين. يتم توضيح الاستخدام العملي للإطار من خلال دراسة حالة ، وهي تقييم أربعة مواقع للسلطات الحكومية في السودان. يتضمن النهج المستخدم في دراسة الحالة بناء استبيان مناسب لتقييم معايير الإطار. تقدم دراسة الحالة بعض النتائج المثيرة للاهتمام فيما يتعلق بأوجه القصور في مواقع الحكومة السودانية. تشير النتائج إلى أن معظم مواقع الويب الحكومية السودانية تركز أولاً على إمكانية الوصول وثانيًا على التصميم وقابلية الاستخدام خاصة على بنية الصفحة ، وثالثًا على المحتوى. على وجه الخصوص ، تحصلت جميع المواقع على درجات منخفضة جدًا في الخصوصية ؛ الخدمة الإلكترونية ؛ ومعايير إشراك المواطنين.

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1. CHAPTER ONE

INTRODUCTION

1.1.   Background

Web based systems nowadays considered to be the first choice for government and even private corporations when it comes to providing public services (e-services) for large numbers of users in wide different locations. According to (Fraga, 2001), e-Government is the transformation of public sector internal and external relationships through net-enabled operations, IT, and communications in order to improve Government service delivery, public participation, Society.

There are some benefits assured by application of E-government (Ndou, 2004) like improving efficiency by reducing the time spent upon manual tasks, cost reduction, Quality of service delivery and improve the quality of decision making, but many challenges remain which hamper E-government application in developing countries like Sudan. The target of eGovernment encompasses four main blocks that are: Government to Citizens (G2C); Government to Business (G2B); Government to Government (G2G); and Government to Employees (G2E).

this research will consider the first block only, Government to Citizen which deals with the relationship between Government and citizens allowing customers to access government information and services instantly, conveniently, from everywhere, by use of multiple channels (PC, mobile phone or wireless device).

Cambridge dictionary defines frameworks as "*the ideas, information, and principles that form the structure of an organization or plan*" (Cambridge Dictionary, framework). Most of Government provides frameworks to achieve high quality, easy to use, customer-happiness of their websites while portraying a coherent and uniform image. This Web framework brings together a wide range of best practices, checklists, templates, and other useful information to help Government Entities plan and implement effective online communications.

For Sudan, the software standards commission under National Information Center published a document in 2010 as a set of guidelines to create better and more usable government web sites. (National Information Center, 2010). Beside that there is no proved framework for Sudan government website development.

1.2.   Problem Statement

Sudan government entities provide a wide range of information and services in their websites to fulfil their customers' needs, however; No evidence that an evaluation has been made to ensure that theses websites are aligned with internationally accepted best practices and standards.

1.3.   Objectives

1. To build the framework by extracting guidelines from literatures and internationally accepted best practices to be used by Sudan government entities when developing their websites.
2. Develop a checklist from the guidelines to be used in the evaluation process.
3. Demonstrate the actual use of the framework by evaluating some websites of Sudan public authorities to ensure their alignment with guidelines thus achieving high levels of customer happiness.

1.4.   Significance

By formulating a framework to be adopted by Sudan Government Entities in their websites we ensure that all E-government websites are highly accessible, well-designed and usable, providing appropriate content and supported by policies to achieve high levels of customer happiness and website usage. In addition, to ensure the accuracy and uniformity of their content.

1.5. Thesis Organization

The study has structured as the following:

Chapter 2 Provide Background and Literature review of the thesis

Chapter 3 Contains the Research Methodology.

Chapter 4 Shows the Evaluation and Results Discussion.

Finally, Chapter 5 Concludes the study.

2. CHAPTER TWO

LITERATURE REVIEW

This chapter reviews the concept of E-Government and Website Evaluation. And provide an overview of the current situation of Sudan E-government. And also covers literature review and previous studies related to this study.

2.1. The Concept of E-Government

The concept of E-Government is a multidimensional, complex, and in its infancy stages of development that is why there are varying definitions of it. According to the World Bank, (2012), 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. Also, (Fraga, 2002) defined e-Government as the transformation of public sector internal and external relationships through net-enabled operations, IT and communications, in order to improve: Government service delivery; Constituency participation; Society.

There are other definitions from different organizations, but we notice that the crucial element of all of them is the use of ICT tools to reinvent the public sector by transforming its internal and external way of doing things and its interrelationships with the stakeholders. Those stakeholders classify E-Government into multiple dimensions:

   i. *Government to government (G2G)* which represents the secure exchange of information and transactions between different government departments
   ii. *Government to business (G2B).* This aspect is concerned with the provision of government services for the economic and business enterprises and investors.
   iii. *Government to Citizen:* deals with the relationship between government and citizens. Allowing customers to access government information and services instantly, conveniently, from everywhere, by use of multiple channels (PC, Web TV, mobile phone

or wireless device). It also enables and reinforces their participation in local community life (send an email or contribute to an online discussion forum).

iv. *Government to Employees***:** refers to the relationship between government and its employees. (Riley, 2001)

Focusing in the citizen dimension, the e-Government aims to provide efficient dissemination and management of information to the citizen; better service delivery to citizens; and empowerment of the people through access to information and participation in public and policy decision-making. (Ntulo, G. and Otike, J., 2013).

2.2. Stages of E-Government

Many e-government authors have investigated the development of e-government and proposed different types of stage models. one of these studies is Layne and Lee 2001, they proposed four stages of e-Government. The first stage, *cataloguing*, governments are focused on establishing an on-line presence for the government by providing citizens with access to online information. The second stage, *transaction*, involves adoption of interactive processes between government and citizens allowing them to conduct government services electronically like renewing their licenses and pay fines on-line, which results in higher efficiencies in service delivery. The third and fourth stages, *vertical integration* and *horizontal integration* are related to the previous stage, as the quantity of e-transactions increase, governments will be pressed to integrate the states' systems with the web interfaces. This integration may happen in two ways: vertical and horizontal. Vertical integration refers to local, state and federal governments connected for different functions or services of government. While horizontal integration is defined as integration across different functions and services.

Another modal for the stages is in the survey done by American Society for Public Administration and the United Nations 2001, they categorized the online presence for each country into five stages: emerging; enhanced, interactive; transactional; and fully integrated or seamless. these stages are covered in Table 2.1.

Table 2.1: The stages of e-governments

Stage	Definition
Emerging	An official government online presence is established.

Enhanced	Government sites increase; information becomes more dynamic.
Interactive	Users can download forms, e-mail officials and interact through the web.
Transactional	Users can actually pay for services and other transactions online.
Seamless	Full integration of e-services across administrative boundaries.

2.3. E-government in Sudan

In the context of efforts to implement e-government in Sudan, great efforts have been made, the most important of which is the establishment of the National Information Center, NIC play a consultant role for the Sudan government and it is in charge of all ICT related projects within government and prepared the Sudan e-Government Master Plan and Transition to Smart Government 2016-2020 , as a roadmap to transform Sudan into an advanced society capable of achieving sustainable development by providing and improving the performance of government services, by the year 2020 (Yousif, E., 2017). The plan was based on five strategic objectives:

- Improving the quality of electronic services.
- developing, facilitating, and improving the efficiency of government business.
- Supporting efforts and enhancing trust and reliability in e-business.
- Governance, transparency, and community participation.
- Achieving leadership in the field.

In accordance with these objectives there are four main axes: Availability and access to electronic services; Electronic transformation in the government business; Enhance security and protection; Develop regulatory and legislative frameworks, policies, standards, and indicators. The fourth axis is concerned with building capabilities, structures, legislation, and systems related to e-Government and it includes organizing policies, guidelines, frameworks, and standards that manage e-Government work.

The NIC published a report that outlines the position of implementing the requirements of the E-Governments (NIC Reports, E-Government Implementation Report 2016), they mentioned the work done since 2016 to achieve some of the objectives of the master plan. In the area of systems and applications they developed variety of systems in six ministries, like the E-15 system at the Ministry of Finance; Online Admission System and Electronic Submission System at the Ministry of Higher Education and Scientific Research; Online Application System

for Doctors at the Ministry of Health. also, in the area of electronic services they established the first version of Sudan Electronic Portal for the purpose of publishing electronic services to citizens.

According to the E-Government stages defined by the United Nation study (as shown in Table 2.1) most ministries in Sudan are in the emerging stage: having just a website with no services to be conducted online or not even a description of the services that the ministry offers. Some of them have no website. But some ministries like the Ministry of Higher Education and Scientific Research have shown a good progress by offering number of services where users can see dynamic information about the service, send e-mails and to fill online form to apply to a service (https://esudan.gov.sd/).

2.4.   Website Evaluation

Reviewing the literature on the subject of website evaluation characteristics there are many methods, frameworks and quality model. from specific business sectors quality models to more generic usability methods originating from fields such as human–computer interaction and document design (Elling, S., Lentz, L. and De Jong, M., 2007).

Traditionally, website evaluations have focused on usability, defined 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"*. (Allison, R., Hayes, C., McNulty, C.A. and Young, V., 2019). but since the user engagement and interaction with websites increased in the last decade, website evaluations have shifted their focus to users' experience, employing various assessment techniques.

In 2011, Nabil, D., Mosad, A. and Hefny, H.A developed conceptual quality model for web-based applications (WBA), the proposed WBA Quality Model (WBAQM) applies bottom-up mechanism and focuses on defining different WBA quality factors and WBA quality sub factors based on ISO 9126 quality frameworks. Then it attempts to link these quality factors and sub factors together. Figure 2.1 shows the levels that constitute this model.   In layer 1 they identified WBA views from different perspectives; Developer perspective, Owner perspective, and Visitor perspective. Visitor concerns involve quality factors that are most important to WBA visitors and are reflecting the needs and performance of the visitors with various characteristics.

Those quality factories are; *Usability, Accessibility, Content, Credibility, Functionality, Security, And Internationality.*
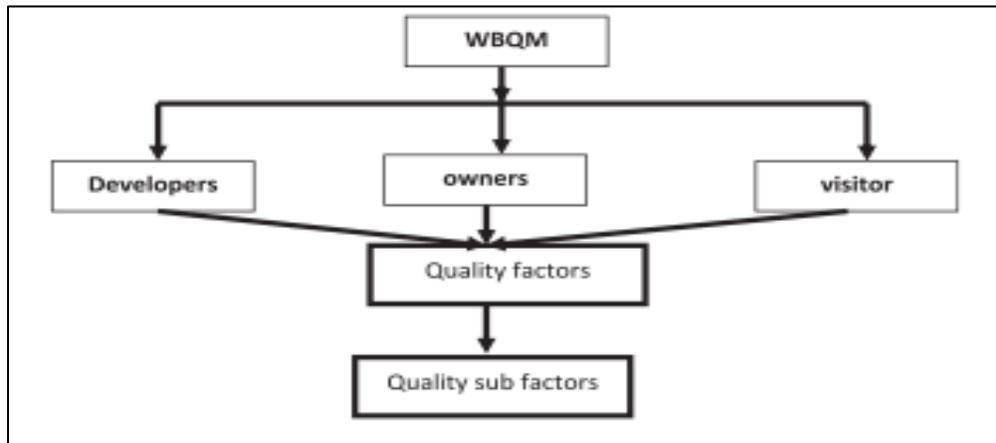
Figure 2.1: WBA quality model

2.5.   E-government Website Evaluation – Related Work:

To assess the websites of public authorities many different categories, criteria and metrics are utilized. For instance, Panopoulou, E., Tambouris, E. and Tarabanis, K. (2008) propose a framework for evaluating websites of public authorities that applies three different levels of detail. The higher level consists of four axes that measure four different aspects of e-government websites. The second level consists of factors that measure each distinct axis. The third level consists of the specific metrics used to perform the evaluation. Each proposed axis along with its factors are shown in Table 2.2. The practical use of the framework is demonstrated by means of a case study, namely evaluating the websites of Greek public authorities at local and regional level.

Table 2.2: Panopoulou, Tambouris, and Tarabanis, proposed framework

axes	Factors
General characteristics	Accessibility, Navigation, Multilingualism, Privacy, Public outreach
e-Content axis	General content, Specific content, News and updating
e-Services axis	Services number and level, General information
e-Participation axis	Information, Consultation, Active participation

In 2014, Fath-Allah, A., Cheikhi, L., Al-Qutaish, R.E. and Idri, A. defined e-government categories into four aspects: Back-end, Front-end web design, Front-end web content, and

external. this classification reflexes the nature of the websites (e-portals) structure which consists of front-end part, back-end part, and external part, for each of the categories they defined a set of subcategories then provided a definition for those subcategories. Table 2.3 provide details of the best practices.

Table 2.3: E-government e-portal's best practices

Category	Subcategory
Back-end	Customer Centricity, Interoperability, Use of Standards, Modularity, Security, Privacy, Single sign on, Delegation, E-participation, Payments, Workflows, Responsiveness
Front-end web design	One-stop-shop, Ease of navigation, social networks, Personalisation, User forms, Industrialisation, Structuration
Front-end web content	Relevancy, Accessibility, Search engine, Periodical change, Rich content, Interactive Games, Mobile Apps, Statements, Translation, Understandability
External	Advertising, Referencing, Incentives, Contests, Reusability

Huang, J.Q., Guo, W.L. and Fu, L.T in 2019, constructed an evaluation system of the e-government website and used the analytic hierarchy process to determine the weight of each evaluation index, the fuzzy comprehensive evaluation method is used to evaluate the e-government website, in order to provide reference for the construction of the e-government website. The initial model of the public satisfaction evaluation index system was sent to 15 experts for review. Finally, combined with the opinions of various experts, the four criteria indicators with the highest public concern were selected, and the secondary indicators with higher importance in each criterion layer were extracted to establish an evaluation system for e-Government websites. The primary and secondary indicators are shown in Table 2.4

Table 2.4: Huang, Guo, and Fu, Evaluation system

Primary indicator	Secondary indicator
Information disclosure	Regulatory Document, Notice Announcement, Special column, Statistics
Online service	Service Guide, Resources Download, Online service, Service Query
Public participation	Leadership mailbox, Online interview, Online consultation
Website construction	Page design, Information search, Access speed

However, we notice that every author has his own way to describe each category by specific name resulting on having the same concept with different wording. An example is customer centricity that can be named as user focus, customer-centric, user-centric, or customer intention (ECTQM, 2002; World Bank, 2005; Forfás, 2008; Berntzen and Olsen, 2009). For the ambiguity caused by non-categorisation and different wordings, the developers or designers of the e-Government portals may face difficulties when trying to use those best practices. That is way most of the leading countries in the field of e-Government used some existing best practices and tailored them to structure their own best practices or guidelines in the field of e-Portal design and evaluation to help bring coherence to their Federal Government messaging on the internet, and to ensure that all websites and associated web channels are in line with the international standards.

2.6. NIC Web Site Standards v1.0:2010

In 2007 the National Information Center established a unit specialized in formulation of standards, there are three committees under this unit: Committee on Standards in hardware and network; Committee on Standards in operating systems, confidentiality, insurance; and Commission on software standard.
The software standards commission published a document in 2010 titled "Web Site Standards V1.0" as a set of guidelines to address two issues, first to create better and more usable government web sites and web porta, second to provide quantified, peer-reviewed web site design guidelines (National Information Center, 2010).

2.7. Selected Guidelines: Dubai Smart Websites Excellence Model

Smart Dubai Government (SDG) Establishment developed the "Smart Websites Excellence Model (SWEM)". SWEM provides a set of guidelines to be adopted by Dubai Government Entities in their websites to achieve extended maturity in line with internationally accepted best practices and standards (Smart Websites Excellence Model, 2017). SWEM (Smart Websites Excellence Model) consists of 3 main elements: Concept, Components and Objectives. The concept is to understand and define the users/customers of the website "Customer-Focus Concept". The guidelines intend to achieve two main objectives: High Levels of Customer Happiness and high Levels of Website Usage.

SWEM consists of 4 components (Accessibility, Usability & Design, Content, Functionality). each component consists of a set of guidelines. Table 2.4 contains samples from these guidelines.

Component 1: Accessibility

The goal is to create a government website that is inclusive and accessible to the widest possible audience with vastly different learning styles and capability levels.

Component 2: Usability and Design

The branding elements of a website should convey a single, unified message to all users and should include and utilize Dubai Government's as well as the entity's imagery, iconography and visual cues.

Component 3: Content

The content needs to be alive, current, accurate, relevant, and easy to read for users in order to have a reason to return to the site again.

Component 4: Functionality

The website should function as promised by entity and as expected by customers and should work entirely error-free and website response times should be defined and delivered in line with customer expectations.

Table 2.5: Sample of the guideline from each component

Component	Guideline Sample
Accessibility	Provide Access to the Website Through an Easy to Remember URL including an Appropriate Representation of the Entity Name under (.ae) domain.
Usability and Design	Provide clearly defined common elements on the website, mainly on the website header and footer, and applicable menu for mobile websites.
Content	Provide Information about the Government Entity in "About Us" Section.
Functionality	Ensure that the website meets customer expectations and needs.

3. CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the methodology adopted in this study; First, literature search has been conducted to explore the field of website evaluation the keywords included *e-government, e-government website, website evaluation, website evaluation framework, government web guidelines, website quality model, e-service, public e-service, e-government portal evaluation, quality factors, web-based application*, *e-government portals best practices, website evaluation criteria.*

Second, we reviewed the abstract of each literature to find if its relevance to our study, we included literature that provided government website evaluation criteria and discussion of the public nature of websites.

Third, the selected literatures were used to derive criteria for evaluating public websites. as well as their meanings and definitions that the literature used. We grouped similar evaluation criteria based on their meanings or definitions, not their terms.

Forth, we start building the framework by defining a set of factors to measure each criterion and their related guidelines to be used when developing a government portal to ensure consistent quality across all Sudan government websites. To formulate the guidelines, several worldwide proved Government Websites best practices and guidelines examined and then from them only what could be applied and tailored to Sudan government website will be considered in our framework.

Fifth, the guidelines were used to drive an evaluation checklist, to test the efficiency of the proposed framework, this checklist is applied on a case study which was evaluating four Sudanese e-Government sites. only the questions that does not require checking the website source code were including in the checklist because the evaluators did not have access to it.

3.2. Evaluation criteria

From the selected literatures described in the previous chapter (for example, Panopoulou, E., Tambouris, E. and Tarabanis, K., 2008; Fath-Allah, Cheikhi, Al-Qutaish, and Idri,2014; Karkin and Janssen, 2014; Lee-Geiller and Lee, 2019; Garcia, Maciel and Pinto, 2005) we notice that:

- All of the studies cover the content concept.
- Some of the studies mentioned the usability concept explicitly (Karkin and Janssen, 2014) while some referred to concepts related to usability (for example, Fath-Allah, Cheikhi, Al-Qutaish, and Idri, 2014 mentioned *Ease of navigation* as a subcategory from the front-end web design best practices).
- There are concepts that are related to the marketing of the e-portal like Advertising; Referencing; Incentives; Contests; Reusability (Fath-Allah, Cheikhi, Al-Qutaish, and Idri, 2014) we excluded them as they are out of the scope of this study.

    From the mentioned literatures some common criteria can be derived namely; content, usability, privacy, accessibility, design, functionality, and citizen engagement. As described in Table 3.1

Table 3.1: Commonly used website evaluation criteria

	Panopoulo, Tambouris and Tarabanis (2008)	Fath-Allah, Cheikhi, Al-Qutaish, and Idri (2014)	Karkin and Janssen (2014)	Lee-Geiller and Lee (2019)	Garcia, Maciel and Pinto (2005)
Content	✓	✓	✓	✓	✓
Usability	✓	✓	✓	✓	✓
Privacy	✓	✓		✓	✓
Accessibility	✓	✓	✓		✓
Design	✓	✓	✓	✓	
e-Service	✓	✓		✓	
Citizen engagement	✓	✓	✓		

3.2.1. Content

The content available on a website is a very crucial element in ensuring the success of website in meeting users' needs and expectations. The content needs to be alive, current, accurate relevant and easy to read for users in order to have a reason to return to the site again. Almost all literature references on website evaluation refer to some degree to content and offered information. Karkin and Janssen, 2014 talked about the content issue, they mentioned that information and the design of websites must be directed to the interests of a variety of citizens or users under assorted categories.

In this study we take the content from two dimension, first is the content relevancy which is structuring of the e-portal's web content according to the citizens' needs so that the user can easily and quickly find the useful information for him or her; and second dimension is about content currency to examine the frequency of content updating.

3.2.2. Usability and Design

ISO 25010 Quality Model defines usability as "*the degree to which a product or system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use*".

The usability of e-government has consequences and effect on individuals' satisfaction, expectation and belief, website design, such as effectiveness and efficiency of use, behaves as the critical component, not only impacts individuals' experience, but also leave individuals' interaction with e government positively. Hence, enhancing website design, specifically with regards to navigation, aesthetics, content, accessibility, and customization is extremely likely to motivate users' adoption of e-Government. (Chang, C. and Almaghalsah, H., 2020)

Garett, R., Chiu, J., Zhang, L. and Young, S.D, 2016 conducted a literature review to identify and select a short list of frequently used design elements that influence user engagement. The design elements mentioned most frequently in the reviewed literature were *navigation, graphical representation, organization, content utility, purpose, simplicity, and readability*.

effective navigation is the presence of salient and consistent menu/navigation bars, search features, and easy access to pages. Engaging graphical presentation entails inclusion of images, multimedia content, proper color, font, and size of text. Optimal organization includes hierarchical structure, information arrangement and categorization, and meaningful labels/headings/titles. Content utility is determined by sufficient amount of information to attract

repeat visitors and information relevant to the purpose of the site. The purpose of a website is clear when it establishes a unique and visible brand/identity, addresses visitors' intended purpose and expectations or visiting the site, and provides information about the organization and/or services. Simplicity is achieved by using simple subject headings, website design optimized for computer screens, and consistency in design throughout website. Readability is optimized by content that is easy to read, well-written, grammatically correct, understandable, and presented in readable blocks (Garett, R., Chiu, J., Zhang, L. and Young, S.D., 2016).

For each of the mentioned design elements we will define a guideline to be used when designing that element to achieve better usability and to establish visual consistency in the web presence of all government portals. Table 3.2 contains definition of some of the design elements.

Table 3.2: Design elements definition

Element	Definition
Sitemap	A sitemap is a page, which outlines the structure of the entire website. It helps the users understand the site structure and layout,
Breadcrumb Trails	Links that are usually placed directly above the main page heading to show where users are in relation to the homepage.
Body Links	Icons that represent actions on a web page, including printing, bookmarking and forwarding links.

3.2.3. Privacy

It can be defined as keeping the citizens' data and preferences private from any disclosure (Fath-Allah, Cheikhi, Al-Qutaish, and Idri, 2014).

Research findings indicate that citizens place security and a desire for greater accountability above convenience or the expansion of services and information. To overcome privacy issues, literature suggests the use of secure, encrypted connections for the transmission of personal information and transaction data, and an evident link to a security statement that explicitly explains the way in which citizen data is protected and how it will be used. (Panopoulou, Tambouris, E. and Tarabanis, K, 2008).

To evaluate the privacy of e-government portal, two metrics will consider: and terms and condition statement; and privacy policy statement.

3.2.4. Accessibility

'Accessibility' can be defined as the degree to which the e-government e-portal is accessible to people with abilities and disabilities; this includes people with visual and hearing deficiencies. Thus, accessibility is considered as a priority for e-government websites (Fath-Allah, Cheikhi, Al-Qutaish, and Idri, 2014).

The accessibility concept addresses any kind of accessibility problems, relevant to providing access to the disabled, to technical compatibility in terms of both hardware and software, as well as to supporting multiple languages.

To avoid digital exclusion, e-government websites should aim to facilitate usage by all citizens and businesses independent of circumstances, such as age, origin, disability, and social status. Thus, for e-government website accessibility becomes an important consideration.

For the Accessibility of e-government portal, the following metrics will consider: Accessibility for people with disabilities; Domain naming and Uniform Resource Locator (URL); Compatibility with browsers; and Accessibility through search engine.

3.2.5. E-service

Refers the provision of online public services which is an essential prerequisite for e-government to realize its full potential. "Online services" is one of the five components of the "e-Governance Performance Index" used to evaluate large municipalities worldwide, it assessed the offering of specific services, such as payments, licences applications, violations reports, and ticket purchase. Another method applied for evaluating Australian government websites assessed five specific Government-to-Citizen and Government-to-Business service areas according to the degree of online availability. Furthermore, a global survey on e-government websites measured electronic services through the number of services that can be fully executed online (Panopoulou, Tambouris, and Tarabanis, 2008).

The website should function as promised by entity and as expected by customers. Appropriate website related information and notifications should be provided to customers.

To measure the e-service we will consider following dimensions: Service organization; Error Management; and the documents required to complete the service.

3.2.6. Citizen engagement

Can be defined as the extent to which citizens are able to communicate both with the government agency and with each other through the Website. The availability of opinion polls, bulletin boards and satisfaction surveys are observed (Fath-Allah, Cheikhi, Al-Qutaish, and Idri, 2014).

government can use online form or chat room to allow citizens to engage with their offices. for example, Austria provided forum in their e-portal where citizens can ask questions and receive answers.

Another way to achieve this communication is by getting feedbacks, opinions and suggestions from the citizen. For example, by providing 'have your say' icon in the portal to allow the users who used the service to share their experience with the government entity. Also, for the users who did not use the services we can get their feedback (for example, using telephone surveys) to know why the services are not used.

One important issue in the e-participation is to involve citizens in the policy-making process. Moreover, one of the five priorities adopted by the EU in the i2010 e-Government Action Plan is the strengthening of participation and democratic decision-making, demonstrating by 2010 tools for effective public debate and participation in democratic decision-making (European Communication, 2006).

OECD (2001) defines three levels of participation: information, consultation, and active participation. Information is a one-way channel that informs citizens about a variety of available resources; consultation is a limited two-way channel; while active participation is a more enhanced two-way channel where citizens have more power over policy formulation, for example, by proposing certain policies (Panopoulou, Tambouris, and Tarabanis, 2008).

3.3. Formulating the guidelines

A set of guidelines will be defined for each of the evaluation criteria mentioned in the previous section. These guidelines have been driven from several worldwide proved Government Websites best practices and guidelines.

3.3.1. Content Guidelines

Guideline Number	Guideline
Content Relevancy	
C.01	Provide Information about the Government Entity in "About Us" Section. – E.g., Vision, Mission, Objectives, Organizational Structure, Strategic Plan.
C.02	Provide Sufficient Information about Entity's Services. – For each service provide a: Name, Description, Requirements, Procedure, Forms, Expected Completion Time, Fees, Centers, Related Services.
C.03	Provide Entity Contact Information and government office location(s) along with visual map information. – Physical location through visual maps, Telephone number(s), Hours of operation.
C.04	The content language should be user-oriented, and free of mistakes.
C.05	The format of the content should be easily scannable and consistent throughout the website.
Content Currency	
C.06	The "last updated on" statements should be presented clearly with accurate timings.

3.3.2. Usability and Design Guidelines

Guideline Number	Guideline
Page structure	
U.01	Ensure consistency in the page layout throughout the site.
U.02	The Home page must be accessible from any page in the website.
U.03	Avoid use of the horizontal scroll.
U.04	Use enough and consistent margin in every page.
U.05	The use of animation should be limited to the important items to the user.
U.06	The website design must contain the following elements: global header, navigation, body, and footer
U.07	Each page on a website should have a unique main heading.
U.08	For the page heading use font larger than regular text and a color different from the body text color.
U.09	All page title should be descriptive, easily understood, and must reflect each page's content.
U.10	Provide enough contrast between the dark text and light background.
effective navigation	
U.11	Provide intuitive, predictable, well-structured, self-explanatory, and clear navigation.
U.12	Navigation should enable user to determine where the are in the website at all times.
U.13	Titles should be short, descriptive and matching the destination page heading.
U.14	Highlight the selected navigation item using a different background color.
U.15	The positioning, terminology, and schema of navigation items must be consistent throughout the website.
Home Page	
U.16	The homepage should address the user needs and expectations by including the important elements and valuable information from the users' perspective.
U.17	Should differ from any internal page within the website

U.18	The entity's services should be presented in the homepage.

Global Header	
U.19	The global header area must appear in all pages of a website.
U.20	For Arabic pages it must contain the following: ✓ إتصل بنا ✓ خريطة الموقع ✓ البحث ✓ English

Sitemap	
U.21	Should be Well organized and consistent in all pages of the website.
U.22	Should present a clear hierarchal structure of the website by having major categories, sections and subsections, which are designed, based on users' needs.

Breadcrumb Trail	
U.23	Must be placed directly above the content area in all pages of the website.
U.24	Should show the position of the web page in relation to home page.
U.25	Should reflect the true hierarchy of the website starting from the highest level to the lowest level.

Search Functionality	
U.26	The government entity must provide basic search box in the same position on all pages of the website.
U.27	Should be easily accessible and easy to use.
U.28	Provide clear search results page which include: ✓ A highlight of the searched keyword. ✓ The total number of search results. ✓ A facility to sort the results. ✓ A facility to display a number of results per page. ✓ A facility to navigate among the search result pages (e.g., go to the next page).

Global Footer	
U.29	Should be found at the bottom of every web page.
U.30	should be plain text and must include the following:

	✓ Privacy Policy.
	✓ Terms and Conditions.
	✓ Disclaimer.
	✓ Sitemap.
	✓ A shortcut to key contact details.
	✓ Link for social media pages if found.
Links	
U.31	Link text should reflect the destination page content.
U.32	Ensure that all hyperlinks are correct and in service.
U.33	When linking to an external website, text around the link must make it clear to the user that they are about to leave the Government Entity website
U.34	Links to external websites must open in new browser windows.

3.3.3. Privacy Guidelines

Guideline Number	Guideline
Privacy Policy	
P.01	Government entity should provide clear privacy policy information which address the following: − What user information is collected. − Why, when, and where this information is being collected. − How this information is used and shared by the entity. − what measures are taken to preserve the security of users' information. − Steps a person should take if they have reasonable doubt that their privacy is being compromised.

P.02	the Privacy Policy Should be available and accessible from every page of the website.
Term and Conditions	
P.03	Government entity must include the terms and conditions by which the content and services of the website are provided to its users.
P.04	Should outline the following: − Data ownership details. − A limitation of liability disclaimer. − Information on termination of service.
p.05	Be available and accessible from every page of the website.

3.3.4. Accessibility Guidelines

Guideline Number	Guideline
Accessibility for people with disabilities	
A.01	Provide text alternatives for any non-text content.
A.02	Make it easier for users to see and hear content including separating foreground from background.
A.03	Provide ways to help users navigate, find content, and determine where they are.
Uniform Resource Locator (URL)	
A.04	Provide access to the website through short and easy to remember URL.
A.05	Domain name should be registered using the short or long naming conventions: − Short naming convention: first letter of each word of the entity's name. − Long naming convention: full name of the Government Entity.

A.06	The URL should contain only lowercase.
A.07	Should be under (.sd) top level domain.
Compatibility with Browsers	
A.08	The website should display the same results using different web browsers.
A.09	Avoid promoting one or more particular browser(s).
A.10	Test the website using different most commonly used browsers.
Accessibility through search engine	
A.11	The website should be ranked high within the search results relevant to its core business and services provided.
A.12	The website should be listed in commonly used search engines.
A.13	the following tags should be inserted between the <Head></Head>section of the web pages: − Description tags: should be short and meaningful explaining the purpose and content of the website. − Title tags: Title of the website should be unique. − Keywords: keywords that users will probably enter when looking for the website. − Robots: used to index the website by web spiders.
A.14	Install a sitemap.xml for Google.

3.3.5. e-Service Guidelines

Guideline Number	Guideline
Service organization	
S.01	Ensure categorization of the services if possible. (e.g., most used services)
S.02	Build services around citizens choices.
S.03	Break down steps required to complete tasks.
S.04	highlight current step completed in the process.
Error Management	
S.05	Provide error free website regarding unintended technical issues. (Connection time-out, broken link errors, scripting error, etc.)
S.06	Provide user a clear "emergency exit" to leave unwanted state without having to go through an extended dialogue.
S.07	Error messages should be expressed in plain language, precisely indicate the

	problem, and constructively suggest a solution.
Help & Support	
S.08	offer to users' online guidelines describing the steps required to complete the service.
S.09	Provide Help or FAQ section covering all aspects of the services.
S.10	Availability of sample documents (application, forms, and others) in electronic format.

3.3.6. Citizen Engagement Guidelines

Guideline Number	Guideline
Information	
E.01	Policy documents should be available online for citizens.
Consultation	
E.02	Provide a facility to gather satisfaction, feedback, suggestions, complaint and recommendation on the website.
E.03	increase the input of citizens in decision making by providing decision-making tools (e-polls).

3.4.   The Proposed Evaluation Checklist

Evaluation Checklist	Evaluation				
	Never applied 0	*Poorly applied* 1	*Neutral* 2	*Mostly applied* 3	*Fully applied* 4
Content					
1. Is the content of the website easily scannable?					
2. Are all information about the entity which useful for the citizens is presented in "*About Us*" section?					
3. Does the "*Contact Us*" page offer the essential contact information of the entity? **Hint:** The Essential Contact Information include Phone, email, and electronic map (e.g., Google Maps) of the physical address of the entity's head office and other branches?					
4. Is "*Last Updated On*" statement available in the website?					
5. Is the format of the content consistent throughout the website?					
6. Does the website offer a comprehensive service guide for all entity services? **Hint:** Service description include: *Name, Description, Requirements, Procedure, Forms, Expected Completion Time, Fees, Centers, Related Services.*					
7. Dose the service guide available in visible and easily accessible location?					

8. Is the content language user-oriented and free of mistakes such as grammar, spelling mistakes etc...?					
Design and Usability					
Page Structure					
9. Is a consistent page layout has been maintained throughout the website?					
10. Is page margin consistent in every page?					
11. Does the website design include global header, navigation, body and global footer sections and they are consistent in all pages?					
12. Is there a facility to reach the homepage from any page on the website through a single click?					
13. Are page titles descriptive and easily understood?					
14. Are all page titles in the website representative of the actual content of the page?					
15. Are all page heading have different color and size than the body text?					
16. Are all page heading properly reflect each page's content?					
17. Does the site enable enough contrast between the dark text and the light (or white) background for easy reading and discrimination?					
18. Does the entity website have NO horizontal scrolling where text properly fitted to screen width?					
Home Page					

19. Is Home page design attractive and convenient for the users?					
20. Does the home page include important elements and valuable information from the users' perspective?					
21. Are the entity's services presented in the home page?					
22. Is the amount of text available on the home page kept to minimum?					
Global Header					
23. Does the website global header include the essential Links placed in a clear visible section for the website visitors? **Hint:** essential Links like: *Home, Contact Us, Sitemap, Help and Search/Advanced Search*					
24. Does official Identity (e.g., *logo, name*) of the Government entity exist in the Header?					
25. Does the logo links to the homepage?					
26. Is the header have no animation/flash movies?					
Global Footer					
27. Does the global footer offer a visible link to the Essential Policies? **Hint:** The essential Policies like: *Copyright, Terms and Conditions, and Privacy Policy.*					
28. Does the global footer of the website provide a shortcut of the entity main contact details?					
Sitemap					
29. Does the entity website include up-to-					

date Sitemap that offer links to all pages in an easy-to-use hierarchy?					
30. Is the Sitemap Available at a consistent location throughout the website?					
Breadcrumb Trails					
31. Does the body of the website include breadcrumb trails which are consistent in all pages of the website?					
32. Does the breadcrumb trail present the true hierarchy of the website?					
33. Does the breadcrumb trail progress from the highest to the lowest level from right to left?					
Global Navigation					
34. for a new user, Is the navigation easily recognized and used from the first visit?					
35. Is navigation schema consistent across the website?					
36. Is the selected navigation item been highlighted with different background color?					
37. Are navigation labels reflecting the destination page headings?					
38. Are users able to determine where they are in the website at all times?					
Search Functionality					
39. Does the website provide a working, easily accessible and easy to use Search utility?					
40. Is the search box location consistent in all pages of the website?					
41. Are search results comprehensive and arranged in the appropriate level of relevance?					

Links					
42. Are all links in the website highlighted with different color than normal text?					
43. Do links' text correctly reflect appropriate destination page content?					
44. Are all links correct and active? (No broken links or empty pages)					
45. When linking to an external website, is text around the link make it clear to the user that they are about to leave the entity website?					
46. When linking to an external website, Are Links open as externally linked pages in new browser window/Tab?					
Accessibility					
Accessibility for people with disabilities					
47. Does the website include alternative texts (Alt-Text) for any non-text content?					
48. Are there enough spaces between the lines and paragraphs?					
49. Does the website have a software to read texts and alternative text for visually impaired people?					
Uniform Resource Locator (URL)					
50. Is the website's URL hierarchy simple and user-friendly (i.e., short, lowercase, plain language)?					
51. Is the URL Under (.sd) top-level domain? (i.e. ends with .sd)					
52. Is the URL Clear and explicit in referring to the entity name or its abbreviation?					

Compatibility with Browsers					
53. Are website pages displaying the same results consistently across different browsers?					
54. Is website fully functional and produce consistent results for browsers different versions?					
Accessibility through search engine					
55. Is the website listed in commonly used search engines (e.g., Google, Yahoo, Bing, etc.)?					
56. Is the ranking of the website high within the search result relevant to its core business and services provided?					
57. Is there a proper, short and meaningful website description and Knowledge Panel explaining its purpose and content in search result? **Hint**: Knowledge panels are information boxes that appear on Google when you search for entities					
Privacy					
Privacy Policy					
58. Does the website provide a Privacy Policy?					
59. Is the privacy policy clearly states what specific information is being collected?					
60. Is the privacy policy clearly states why, when, and where this information is being collected?					
61. Is the privacy policy clearly states if this					

information will be disclosed to any other party?					
62. Is the privacy policy clearly states how this information will be used?					
Terms and Conditions					
63. Are the terms and conditions of use of the website clearly defined?					
64. Are the terms and condition cover all aspects of the scope and operations of the website?					
e-Service					
Service Organization					
65. In case that the services have different categories classifications. Are the services been grouped according to specified classifications?					
66. Are large services divided into small steps?					
67. In case completing a service/task requires more than one step, are the current step been highlighted?					
Error Management					
68. No technical errors while completing a task (Ex: connection time-out, scripting errors, page not found, etc.)					
69. Are error messages displayed in plain language indicating the problem and suggest a solution?					
70. Can user easily leave unwanted state without having to go through an extended dialogue?					

71. Does the site have a meaningful and helpful error pages for HTTP client/server errors? **Hint:** HTTP response code starts with 4xx in client errors; and with 5xx in server errors.					
Help & Support					
72. Is guideline document on how to use the service available for downloading?					
73. Are sample documents (ex: application forms) available online?					
74. Does the entity website provide a Help or FAQ section? And does it cover all the services?					
75. Is there an opportunity to contact someone with questions regarding inquiries?					
Citizen Engagement					
76. Are policy documents available online?					
77. Is there a dedicated "Digital Participation" page on the entity's website that enable audience to Participate and collaborate with the entity, and contains details about its e-Participation activities?					
78. Does the website make it possible for visitors to rate the content and submit suggestions for new content?					
79. Does the entity use social media tools and Digital participation tools such as (*Facebook, Twitter, YouTube, forum, blogs, etc..*) to communicate and interact with the public?					

4. CHAPTER FOUR

EVALUATION AND RESULTS DISCUSSION

4.1. Introduction

The framework presented in the previous section has been applied for evaluating four websites in Sudan to demonstrate the practical use of the framework, and draw conclusions on their overall quality.

4.2. The selection of e-government websites

Choosing of the websites to be evaluated using the proposed framework was done based on analysis of the current E-government in Sudan (summarized in Table 4.1). according to Sudan e-Government portal there are 27 ministries,13 of them have official websites and only 4 ministries were in the transactional presence by offering some services that can be performed online (Sudan e-Government Portal).

For the evaluation we selected only the websites in the transactional stage which are; Federal Ministry of Health website; Ministry of The Interior website; Ministry of Higher Education and Scientific Research website and Ministry of Justice website. The last two ministries also offer to the citizens the ability to bay online for the services.

Table 4.1: Sudan ministries online presence

Number of ministries	26
With a government website	13
Not in operation or under construction	13
In the Interactive Stage	4
In the Transactional Stage	2

4.3. Evaluation Process

To conduct the evaluation, 12 participants were assigned to evaluate the websites of 4 government ministries (3 participant in each website). The evaluation was conducted from April

to May 2022. Choosing the participants was based on their experience in web application development each one of them had at least 2 years' experience in developing, testing and managing of web applications.

Each participant followed the same evaluation process, which are: free review, and completing the questionnaire. Free review allows the participants to look through the target e-government website several times. They can freely either look at the overall e-government website or focus on the specific website design elements. After reviewing the target websites, the participants are finally asked to fill in the questionnaire.

The questionnaire consisted of 79 questions in total covering all the criteria and guidelines in the proposed framework. With regard to items scoring, we award between 0 and 4 points for each answer as described in Figure 4.1.

0	1	2	3	4
Never applied	Poorly applied	Neutral	Mostly applied	Fully applied

Figure 4.1: Questionnaire used and criteria weighting

For developing an overall score for each website, a weighting scheme for each criterion is computed according to the numbers of questions in the criteria multiplied by 4 (Fully applied). Table 4.2 describe the number of questions in each criterion and there scoring. Once the assessment results have been acquired from each participant, the **mean** of assessment result have been conducted for each website.

Table 4.2: Scoring of evaluation item

Criteria	Number of Questions	Score
Content	8	32
Design and Usability	38	152
Accessibility	11	44
Privacy	7	28
e-Service	11	44
Citizen Engagement	4	16

4.4. Results

The results of the evaluation of the mentioned websites are presented in Table 4.3. Results indicate that most websites place emphasis firstly on the Accessibility (62.5%) and secondly on Design and Usability (58.5%) specially on page structure, and thirdly on the Content (57.9%). Total website average scoring in e-Service is around 32% which is relatively low and definitely needs further improvement. Privacy aspects of public authority websites are the least developed (17%); the majority of the websites do not offer opportunities for Citizen Engagement (18%).

Table 4.3: Overall results for websites evaluation

	Federal Ministry of Health	Ministry of The Interior	Ministry of Higher Education and Scientific Research	Ministry of Justice	Total
	Per %	Per %	Per %	Per %	Per%
Content	76.03%	54.15%	44.78%	56.25%	57.81%
Design and Usability	81.57%	50.65%	36.62%	65.13%	58.5%
Accessibility	68.18%	56.81%	62.11%	62.88%	62.5%
Privacy	26.17%	0.00%	1.17%	40.46%	16.96%
eService	34.09%	29.54%	25.75%	38.63%	31.82%
Citizen Engagement	20.81%	6.25%	12.5%	31.25%	17.69%

For a better "feel" of the results, Figure 4.2 display total score of all criteria for each website, and Figures 4.3 to 4.6 displays score of each of the sub criteria for each website. In total, all four websites score better in Accessibility, Content, and Design and Usability (Figure 4.2).
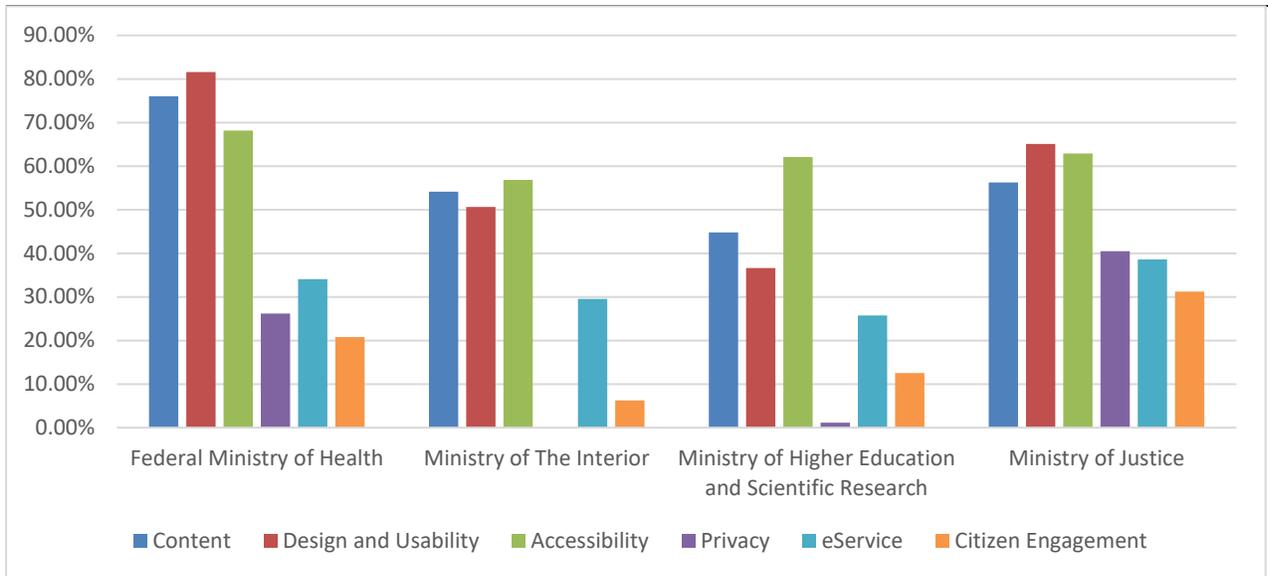
Figure 4.2: Total score of General Criteria per website

With regard to Design and Usability subcategory scoring, all websites score better in Page Structure, however some website scored 0% in: global footer; Sitemap; Breadcrumb trails; and Search functionality. In fact, Sitemap and breadcrumb trails are designed only in one website namely Federal Ministry of Health website (Figure 4.3).
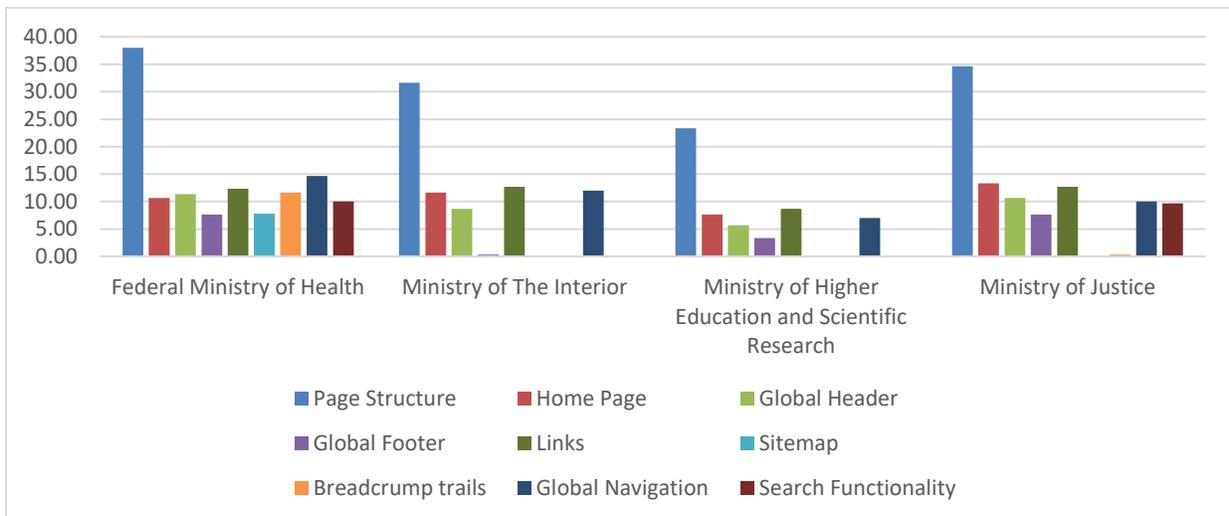
Figure 4.3: Design and usability score per website

For Accessibility subcategory scoring, all websites score better (between 88% to 92%) at Uniform Resource Locator subcategory, but they score low (between 14% to 41%) in Accessibility for People with Disabilities (Figure 4.4).
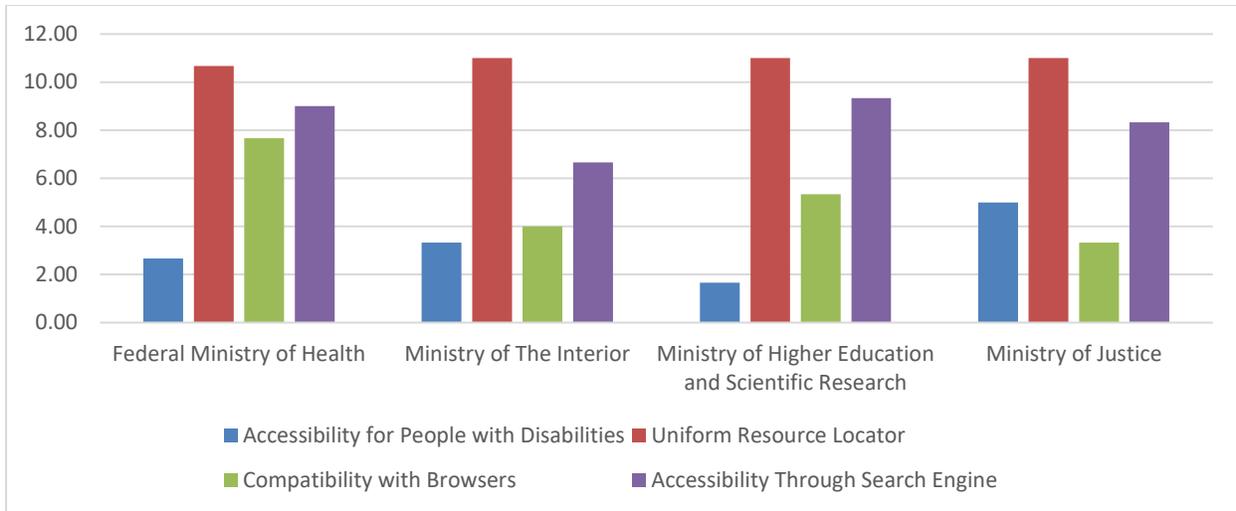
Figure 4.4: Accessibility score per website

Concerning Privacy scoring, majority of websites contained pages for their privacy policy and terms and conditions, however the evaluation result showed that the content of those pages is poorly written and does not cover all information needed by the citizens (Figure 4.5).
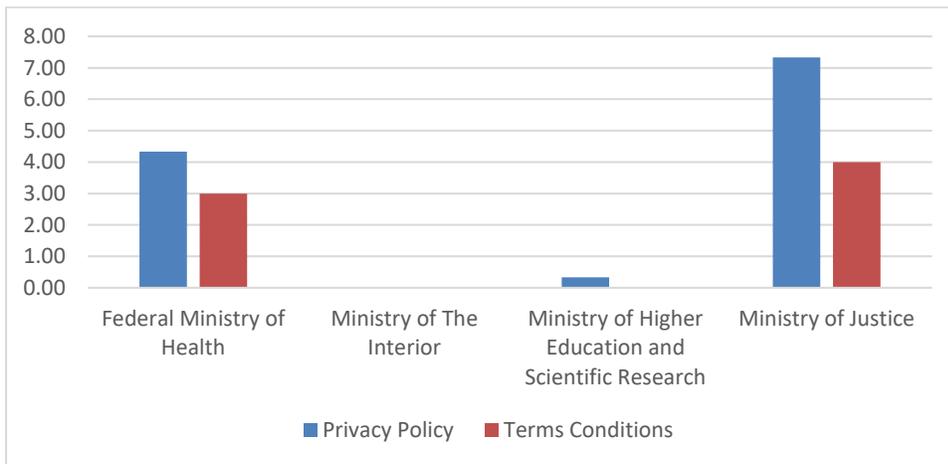
Figure 4.5: Privacy score per website

As for e-Services subcategory scoring, almost all websites score better at service organization and error management. However, they do not provide a good help and support for the services they offer (Figure 4.6).
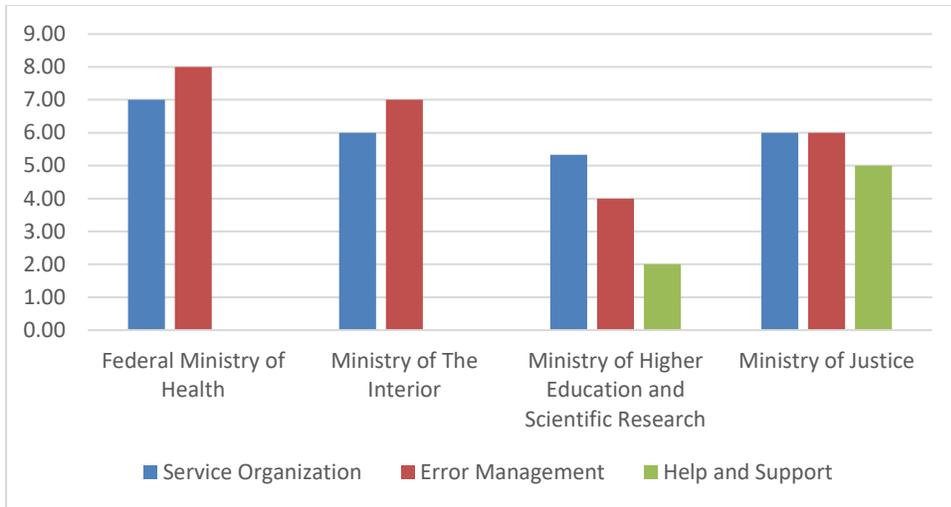
Figure 4.6: e-Service score per website

5. CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1.   Conclusion

E-government can transform the way in which citizens are dealing with the governmental offices. Citizens can complete transactions without having the need to visit those offices. It was also stated that e-government can result in great savings for governmental entities. This research proposes a framework for evaluating the websites of Sudan public authorities. Our framework includes criteria relevant to the general characteristics and features of the websites, as well as to specific functionality addressing the governmental character of public authorities, namely electronic services and citizen engagement facilitation.

The framework contained an evaluation checklist designed based on best practices provided by research papers, industry, international standards, and case studies. Then four websites of Sudan public authorities were chosen to be evaluated using the developed checklist.

The overall evaluation score of Sudan e-government websites was not high.   In particular, all websites score very low in Privacy; e-Service; and Citizen Engagement criteria. Such findings indicate that these websites dose not achieve customer happiness. Therefore, website usage will be very low. Also, we noted that there is no common look and feel throw-out the websites which directly effects the usability criteria.

this framework can be useful to government officials that have implemented or are going to implement e-government websites.

5.2.   Recommendations

It Is recommended to:

- apply the proposed checklist on all websites of Sudan government entities
- to conduct further e-Service evaluation by involving the active participation of citizen who actually need and use the services.
- to conduct surveys and/or interviews with a sample of Sudan e-Government webmasters and site developers to further probe the root-causes of the identified barriers.

However, we recognize a limitation in our research, in that it does not include security criteria because assessment of security issues is not always possible by just visiting the website. Ideally, questions regarding the security and privacy of the website can only be answered by a person with insight into the workings of the government agency itself, such as an agency IT professional.

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