



Sudan University of Science and Technology

College of graduate studies



A proposed Framework for Evaluating the Quality of Websites

إطار مقترح لتقويم جودة المواقع الإلكترونية

*A Thesis Submitted in Partial Fulfillment of the Requirements of M.Sc.
In Computer Science*

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Jan 2018

Abstract

The aim of the research is to provide a proposed framework for evaluating the quality of websites regardless of the nature of the services provided by the website. It is comprehensive in terms of its containment of the main elements of the evaluation, clarity through the possibility of using numerical values to measure indicators and flexibility through its applicability to all websites, regardless of nature of service provided. The elements of the proposed model of content quality, design, organization and ease of use provide a scientifically objective way of evaluating websites and E_ Services through the World Wide Web to improve the service provided, provide a reference and a guide for designers when designing new websites. The proposed model suggests factors that designers of websites should take into consideration when designing website.

المستخلص

يقدم البحث إطار مقترح لتقويم جودة المواقع الإلكترونية بغض النظر عن طبيعة الخدمات التي يقدمها الموقع ؛ يمتاز بالشمولية من حيث احتوائه على العناصر الرئيسة للتقويم ؛ والوضوح من خلال إمكانية استخدام قيم رقمية لقياس المؤشرات ؛ وبالمرونة من خلال إمكانية تطبيقه على جميع المواقع الإلكترونية بغض النظر عن طبيعة الخدمات المقدمة. ويمكن استخدام النموذج المقترح للمقارنة بين جودة المواقع الإلكترونية أو لتحسين صورة وأداء موقع ويب معين. إن عناصر الإطار المقترح من جودة المحتوى ، التصميم، التنظيم وسهولة التعامل توفر أسلوباً علمياً يمتاز بالموضوعية في تقويم المواقع والخدمات الإلكترونية عبر الشبكة العالمية للمعلومات، وذلك بهدف تحسين الخدمات المقدمة وتوفير مرجع ودليل للمصممين عند تصميم المواقع الإلكترونية ؛ يقترح الاطار العوامل التي يجب أن يراعيها مصممو ومطورو مواقع الويب عند عملية التصميم والتطوير.

الأية

قال تعالى: (فَأَوْفُوا الْكَيْلَ وَالْمِيزَانَ وَلَا تَبْخَسُوا النَّاسَ أَشْيَاءَهُمْ وَلَا تُفْسِدُوا فِي الْأَرْضِ بَعْدَ إِصْلَاحِهَا ذَلِكُمْ خَيْرٌ لَكُمْ إِنْ كُنْتُمْ مُؤْمِنِينَ)

الأعراف: 85.

DEDICATION

To the spirit of my father who moved to the mercy of a goddess, we ask God for mercy and forgiveness, to my mother who suffered and was tired with me.

ACKNOWLEDGMENTS

I would like to thank my Supervisor **Dr. Nisreen Beshir**, who made a great effort to make this work a success that I hope will serve of my country and the people.

I thank Sudan University of Science and Technology in general. I would like to thank the College of Computer Science and Information Technology in particular.

I thank all my family for their support and encouragement. And thanks in the first and last to **Allah**.

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Chapter One

1.1 Introduction:-

Information and communication technology has become the wheel of life in our time and has left no room for life else its income, and has become the instrument of the modern era, which is indispensable in many fields and fields. Therefore, it is necessary for all companies and institutions to adopt the technology and the world of knowledge and communications, so that they will ride the giant companies and global institutions that have exceeded the concept of borders with a temporal and spatial dimension. The opening up of world markets and major economic blocs under the digital revolution has moved the world economy to a new stage, adding the element of information to the traditional elements of capital, primary resources and the like. As the digital revolution has become the title of the new global economy, traditional companies and institutions have to catch up with progress and not let the digital divide widen. The new global economy or the digital economy based on information and the speed of access will open up new horizons in the future of business and commerce, which is characterized by the disappearance of time and space through the use of the communications revolution and the associated information technology^[1].

Past years have seen widespread internet, and tremendous growth the number of websites and the accompanying published huge amounts of information, so we are suffering from a new phenomenon is the inflation of information, and the large number of websites without concern for their quality and for its services. The number of websites has grown since the start of the first commercial Web site mid-nineties of the last century to reach 17 million in 2000, then to 65 million in 2005 and exceed billion in another statistic in 2014^[2].

This knowledge explosion of the number of websites has led to the need for standards to ensure the quality of websites which offers services. The main objective behind this large amount of websites is the continuous improvement of the performance of companies and the level of services to their customers in the world of knowledge and the digital economy.

The company's Website on the Internet, has a significant impact on the company's performance, it has become in the world of e-business is the foundation of the work of the companies and institutions that rely principle of electronic services. Therefore, companies and institutions have become keen to offer its best picture of the highest quality, in order to improve the service provided, thus contributing to give a bright picture of the company will be reflected on their performance in a positive way.

The phenomenon of quality assurance has become a basis in all areas of life, and that because of global competitiveness governed by quality, where to stay there for the better. The trend toward big business e-commerce over the past decade, the explosive growth in built on the principle of electronic services electronic trade, has led to concern over the recent years, the quality of websites which offers services. Ensuring the quality of websites is not easy, Norms that can determine that vary depending on the location and nature of the services they provide, and on this basis, we find several special studies evaluating the quality of websites based on the service provided.

Some researchers^[3] have gone to evaluating the quality of websites for businesses and corporations, while others went to evaluating the quality of web sites e-government, while others evaluate the quality of sites of banks and financial business, as the number of researchers evaluate the quality of sites of universities and educational institutions. In addition, others have the assessment of sites offering other types of services such as private websites auction or shopping-mail and the like. Studies and research have varied diversity of websites and the nature of the services provided by the owner of this variation of the criteria

used in the evaluation process, but what characterizes most of these studies is to use the descriptive method is not measurable, and not rely on clear quantitative measurable standards using specific indicators and weights. Add to that the previous studies characterized mostly evaluate a particular type of websites without providing a unified and comprehensive standards for all websites and their services.

1.2 Problem of the study: -

Despite the continued growth of websites and the accompanying published huge amounts of information, whether high or low quality, there is no so far comprehensive standards that are used as a base for evaluating the quality of websites that offer services.

The quality of the company's website which offers services over the internet, reflects on their performance and help with addition information to give a good image of the company. Therefore it has become a necessity to develop a framework for evaluating the quality of websites and services; to measure the efficiency and quality of the website in the provision of electronic services for the enterprise.

1.3 Importance of the study: -

The significance of the study is that it treating one of the critical issues of our time which is witnessing a huge revolution in information and communications technology, providing a framework for evaluating the quality of websites and services a comprehensive, objective and flexibility for optimum website. The proposed framework can be used to compare the quality of websites, or to improve the image and performance of a particular Website, or to provide a reference and guide for web designers when their design for new websites.

1.4 Purpose of the study:-

This study aims to propose a framework for evaluating the quality of websites and services.

1.5hypotheses:-

What are the comprehensive criteria's for evaluation of quality of the websites?

1.6 Objectives of research:-

- Provide a reference and guide for web designers and developers when designing websites.
- Detecting bugs and defects in web site.
- Quality optimization and performance of a particular website.
- Improve the image and performance of a particular website.
- Comparison between websites quality.

1.7Structural of research: -

The structural of research includes the following chapters: -

Chapter one: -

Introduction of research - the research problem - the goals of research - the importance of research – hypotheses - Objectives of research.

Chapter two:-

Literature review including related or previous work done in this area

Chapter three:-

Methodology

Chapter four:-

Results and discussions

Chapter five-

Conclusion and recommendations.

Chapter two

Literature review

2.1 Quality concept

Quality as stated in the oxford dictionary means a high degree of quality or value. The International Standard for quality terms of the year 1994 included a definition of quality as the set of attributes and characteristics of the product or service and its suitability for fitness and use. Fitness for use is the most appropriate quality definition.

The meaning of quality language: is the achievement of something high degree of good quality and good value, quality is a standard reliable, for characterized by the completion of all other achievements in the environment itself and in the same area, and is his prerogative to be completely free of any defect can be a reason to criticize, and be done by pander to a set of rules, laws and standards midwife to verify the quality, and are also measurable, and these standards are found to obtain consumer satisfaction, or the client or user, and even longer that the product has achieved the quality standards must be defects ratio by equal to zero .

Quality is not only limited to the product, it is related to the quality of production, the quality of the personnel, the quality of the inspection, the quality of the stores in which the products are stored, the quality of supply, the quality of post-delivery services, Everything related to the quality of the final product, and entrusted these tasks to the sections of the institution for the purposes of quality control and control and control, and these sections are:

- Quality planning
- Quality assurance
- Quality control
- Continuous development

2.1.2 Four pillars of quality:

Philip Crosby defined four pillars of quality:

1. The definition of quality is matching requirements
2. Quality system is the prevention of errors
3. Standard performance in quality is "zero defects"
4. Quality measurement is the cost of nonconformity

2.1.3 Product quality dimensions

the dimensions of quality in a product were the following points as developed by Garvin (1987), and once they have been achieved we have met the requirements of the consumer ^[3]:

Performance: The ability of the product to perform the functions required of it

Reliability: The maximum duration the product can be usable.

Ambient or Durability: The maximum duration a product can live.

Usability: How easy it is to repair and restore the product to its normal state, taking into the financial cost and the speed of repair.

Aesthetics: The elegance and attractiveness of the product.

Advantages or characteristics of the product: Possibility to add some functions to update and develop the product.

Product Reputation: Manufacturer's reputation for the product.

Compliance with the standards: The extent of compliance with the specifications required by the factory to meet the requirements of the consumer.

2.1.4 Quality Assurance Standards

Quality according to the definition of the ISO 9000: 2005 quality system, quality determines the applicability of a product or service specification to the required specifications. Quality can be described by several qualities that reflect their classification, such as: bad quality,

good quality or excellent quality. It is concerned with the qualities of the same thing and can be measured, such as height, width, weight, proportions, and material properties.

Characteristics such as "beautiful" or "cheap" do not interfere with quality assessment as they are not realistic qualities that can be measured. That is, the price or personal evaluation does not fall into the quality assessment. However, by defining the stakeholder category, they can ask and inquire about the quality of the object and establish the basis for quality assessment, thus becoming a measurable quality.

In Germany, this definition of quality has become effective and replaced the old definition mentioned in the German-European standard system DIN EN ISO 8402: 1995-08 of 1995. It determines the quality of the materials received, the inspection of incoming materials, control of production, inspection of intermediate products, Inspection of material calibration, assembly, final inspection methods, methods of storage, supply and system of dealing with products returned from customers due to corruption.

There is also a special system for the quality of electrical products developed by International Electro-technical Commission (IEC 2371), which defines the quality "matching between the tested specifications and the specific descriptions of a particular unit".

While quality in the past usually describes product or service attributes, that is to say, in line with the demands of customers in the first place, it has expanded its concept into deeper thinking and programs that include "Total Quality Programs" such as "Total Quality Management" the quality of an entire institution. In addition to customer requirements, there are employee requirements, investor requirements, and public requirements (legal requirements), which measure the overall quality of an organization that follows the "Total Quality" system.

2.1.5 Websites:-

The Internet has invaded our modern world, and we cannot stop using the internet in all areas of our lives, small and large. One of the most used and easy to use areas of the internet is the "Websites".

What are websites? What are kinds?

Websites are web pages that we can browse by using a computer with an internet connection. The types of websites differ depending on the location of the website, its content, and the different technologies used to create the sites.

Websites are classified in terms of their purpose and function to: business websites, press websites, e-services websites, personal websites and social websites. As the tariff sites are intended to identify a specific company or party, and the presentation of its objectives and ideas and vision and its productions and other associated. Commercial websites, one of the most famous types of websites and one of the reasons for the e-commerce revolution, are dedicated to online sales and purchases, where a company offers its products through the websites, and the process of selling and buying. As for the press websites are sites interested in the transfer of news, articles, and literary and intellectual productions.

As for e-services sites, they provide e-services that allow users to go to the company's place of business, such as completing important transactions at the bank through these websites. Personal websites are sites that are interested in identifying a particular person, his work and his productions. The most popular websites today are social networking sites such as Facebook, Twitter, Instagram, and community forums.

Websites are also categorized into two types of technology: Static websites and changing website. Static sites are sites that use only one method in their programming, and contain static content that does not change, such as personal and informational sites. Changing sites are the most difficult programming sites, and use different and complex programming

languages; electronic content is not static and varies from time to time, such as press, commercial, and social sites. These may be classified as static websites and interactive websites (changing websites).

Websites are classified professionally to amateur sites and professional sites. It is also classified in terms of funding to sites with personal funding, sites funded by foundations, philanthropic sites, commercial financing sites, and promotional financing sites. These sites are also classified in terms of presentation to sites based on dazzling, or sites based on information and attraction, and sites based on subscribers. It is also classified by target audience into sites targeting a professional audience, sites targeting a general audience, and sites targeting a specific audience, nationalities or segments.

One of the most popular search sites is Google, Yahoo!, and Facebook. The most popular e-mail sites are Outlook, Yahoo and Gmail.

2.1.6 Quality Models and Website Quality:-

2.1.6.1 ISO Quality Models:

The first model identifying quality within software was in the mid 1970's. The International Organization for Standardization (ISO) in cooperation with the International Electro-technical Commission (IEC) finished the development of the new standard "ISO 9126 - information technology – software product evaluation quality characteristics and guidelines" [5]. It defined the quality model that can be applied to any kind of software product or service. In the process of standard revision, two series have been established: series ISO 9126 defined the quality model and series ISO 14598 described the quality evaluation process. This standard divided quality into six basic characteristics: functionality, usability, efficiency, reliability, maintainability and portability.

A subset of characteristics from the ISO model is part of the second level in the proposed model, where each characteristic is broken down into a set of sub-characteristics, which are in

turn further broken down into a set of indicators at the third level. The choice of indicators is based on a set of web quality guidelines, W3C standards and the analysis of the existing websites.

Figure [2.1.6.1] is represents the hierarchy of the proposed model. Looking from the top, the quality of characteristics depends on the quality of its sub-characteristics, which in turn depend on the quality of their indicators. However, looking from the perspective of the indicator, the quality of each indicator influences the quality of the appropriate sub-characteristic, which in turn influences the quality of the appropriate characteristic in the quality model.

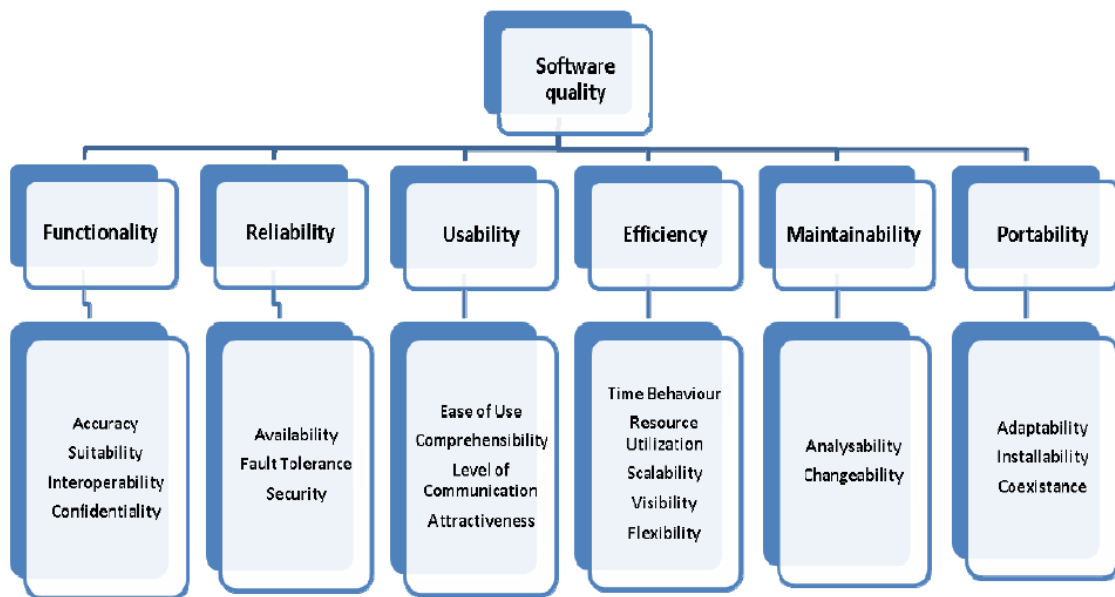


Figure [2.1.6.1] Quality Model Hierarchy

2.1.6.2 Website Quality:

Definition of website quality is how well a website is designed and how well the design meets with the user's satisfaction. Website quality (or Quality of Websites) could be measured from two perspectives: Programmers, and End-users. The aspects of website quality from programmers focus on the degree of Maintainability, Security, Functionality, etc. Whilst the end-users are paying more attentions to Usability, Efficiency, Creditability ^[9].

Expanding these concepts, the usages of website quality may depend on:

1. Task-related factors that affect end users such as presentation quality and contrast.
2. Performance-related factors that affect the efficiency for end users and the technologies of websites, for example, response time, transaction output and reliability.
3. Development-related factors that affect developers and maintainers of a website.

For instance code complexity, code readability, portability and modifiability. "How to clearly define these factors?" A concept (quality model) will be the leading factor in achieving website success and will apply to the majority of current live websites. From previous research, the quality website is developed from quality of software. Gerald Weinberg ^[9] defined that the quality of software is inherently subjective and different people who will experience different quality even in the same software. It can also apply in a website as meaning that user satisfaction is more important than anything (This issue is reinforced in this study).

The ISO 9126 definition of quality for software products is:

The totality of features and characteristics of a software product that bear on its ability to satisfy stated or implied needs.

Attributes of software may include a very large list of properties, possibly at the different levels of detail. Some attributes are internal (i.e. can be measured by examining the product, separate from its behavior); others are external (i.e. can be measured only with respect to how the product relates to its environment). For example, size is an internal attribute, whilst the user error rate is external.

A website is just like software (i.e. it applies to some entity, or some prototype, orbits information architecture) defined in terms of a system of attributes, e.g. readability or coupling. Finally an assessment of the attributes that is a certain product possesses.

These aspects taken together are called the quality model ^[10] introduced website quality model which shows an approach to the definition and measurement of website quality. It

describes the trade-off between the user's needs to be well-established and flexible functions to permit the web application with diverse content.

Generally the website quality is prone to subjective interpretations unless it is quantified by a web quality model. A web quality model needs to define website quality requirements which are identified by a set of measurable attributes and meet the users 'expectations. In other words, to evaluate the quality of website, the appropriate metric shave to be defined.

2.2 Related studies:-

Quality Models for Websites-Isabella Biscoglio^[7] many approaches to quality models for websites have individualized different characteristics which often make reference to few concepts, as Usability, Content, Navigability, Management and Relationality; these concepts in fact assemble characteristics which probably are not totally independent, and which, though presented with different labels, have similar meanings or recall the same concept. In this work a short survey is introduced about Websites quality models: for every websites quality models, the characteristics and their meanings were considered.

From the observation of these approaches, it was possible to define an "ideal" quality model, to be used as an operative reference, with defined goals and independent, comprehensible, adoptable, and measurable criteria.

This work belongs to a research effort aimed at establishing the asset for a service activity of websites evaluations, to be carried on at the systems and software evaluation center.

Any attempt to evaluate the quality of a website requires, implicitly or explicitly, a quality model.

Regarding to quality is opportune to distinguish the type of quality we want to refer to, or following the perspective adopted by the norm ISO/IEC 9126, internal quality, and external quality and quality in use. The type of quality we are interested in a website, essentially, is the quality perceived by the site's user, which is the quality in use. The user expectations regarding the information to acquire can be summarized as follows:

- Readable and comprehensible

- Accessible (i.e. transferable from the Website domain to users' personal knowledge) despite user's physical or mental handicap, lower degree of education or old generation browser
- Available in brief time and without too many obstacles
- Exhaustive and pertinent
- Easily traceable
- updated when necessary and opportune
- secure
- Able to increase user's knowledge and open to the exchange of further communication (information, ideas, opinions...).
- Able to provide a service which is explicitly declared within and about the Website

Nevertheless, since the quality positively perceived from the user is hardly achieved without a good intrinsic code quality and good performances, we hold opportune that a quality model shouldn't disregard to consider both internal and external quality.

For evaluating websites quality, some approaches found in the big literature repertories consider general criteria, or criteria adaptable to different kinds of websites, while others are focused on different criteria regarding to different types of websites to appraise, such as public administration websites, cultural websites, commercial websites, and medical information websites. Rather often, some evaluation criteria are revealed common to quite different websites; consequently, some websites quality models will be considered regardless of type of site, but having care of underling their differences (that, for some models, are translated in different weights).

In the following a short survey of websites quality models, proposed in the last few years that cover various points of view in observing, gauging and finally evaluating a website are summarized.

The purpose of this paper is to point out similarities and novelties proposed by any specific quality model and comparing their characteristics.

Implementation of a model for websites quality evaluation ^[6]the rapid growth of web applications increases the need to evaluate web applications quantitatively. In the past few years some valuable works like WebQEM (Web Quality Evaluation Method) tried to objectively evaluate the web applications. However, still weighting web attributes which is one step of evaluation of web applications is completely subjective, depending mostly on experts' judgments. In this paper, a quantitative evaluation strategy is discussed to assess the quality of websites and applications (WebApps). The methodology is useful to systematically assess characteristics, sub-characteristics and attributes that influence product quality. This paper analyze phases and activities, describes the produced deliverables, and present models, methods, procedures, principles and tools to apply in these activities. In addition, paper outlines the approach and its solutions, using a specific website for evaluation, and other carried out field studies. Finally, paper describes thoroughly an evaluation process. evaluate the quality of websites ^[8] this study discussed assess the quality of websites as one of main resource for information especially in light of the rapid technological development, through the evaluation was to make a comparison between the Arab and foreign websites surveyed in the light of the standards that have been adopted in the assessment.

Website quality assessment criteria ^[9] this study presents a hierarchical framework, which supports website quality assessment. The framework is composed of a hierarchical structure of criteria and sub criteria and makes use of the analytic hierarchy process to enhance criterion and sub criterion weight value assessment. To validate the framework we conducted an experiment, which involved the assessment of the websites of the three cellular phones service providers in Greece by 122 users. Results confirmed framework validity and

statistical factor analysis supported reduction of the original model to a website quality scoring framework, which involves nine composite criteria.

Chapter three

Methodology

3.1 Introduction

This research provides a framework for assessing the quality of websites the framework is called WEQASS (WEBSITE Quality ASSESSING).The framework provides an instrument for evaluating the quality of websites.

3.2 The Proposed Model

The proposed model suggests factors that designers of websites should take into consideration when designing website.

The framework consists of five main criteria: content, design, organization, usability and functionality. The result from each evaluation criteria a set of indicators used to evaluate the quality of a website to access an ideal website. And can use the framework to compare the quality of websites, to improve the appearance and performance of a particular website, or to provide a reference and a guide for designers when designing new websites.

#	Characteristic	Description
1	Quality of content	<p>1.1 Update: Updated information on the website. This indicator can be measured according to the following items:</p> <ul style="list-style-type: none">• Information on the website is up to date.• The number of update rates within a specified time period, reasonable.• The clarity of the user's last updated time <p>1.2 Relevance: The relevance of the website to the organization in terms of content, comprehensiveness and detail of information. It can measure this indicator by the</p>

		<p>following items:</p> <ul style="list-style-type: none"> • The website contains information about the organization's objectives. • The website contains information about the establishment of the institution. • The website contains information about the beneficiaries of the institution. • The website contains information about the products or services provided by the organization. • The website contains an explanatory picture of the institution. <p>1.3 Multilingualism and culture: The availability of browsing in more than one language and the different cultures of different browsers consider the state to which they belong. This indicator can be measured according to the following items:</p> <ul style="list-style-type: none"> • Browsing is available in more than one language • Consider the different culture of users regardless of the state to which they belong. <p>1.4 Variety of presentation style</p> <ul style="list-style-type: none"> • The website contains text files. • The website contains audio files. • The website contains video files.
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		<ul style="list-style-type: none"> • The website contains image files. <p>1.5 Accuracy: Accuracy of information. This indicator can be measured according to the following items:</p> <ul style="list-style-type: none"> • Accuracy of the information on the website. • There are no grammatical or linguistic errors on the website. • Sources of information on the website are reliable <p>1.6 Responsibility: How confident the user is with the information received. This indicator can be measured by items:</p> <ul style="list-style-type: none"> • The physical address of the company is available on the website. • Information on senior management with the functional status of the administrators. • There is information about the copyright of the website. • There is an e-mail to the site owners to contact them.
2	Quality of design	<p>2.1 Attractiveness: The website's attractiveness in terms of innovation in design, beauty in images and movements, so that makes the user happy and enthusiastic to visit the site.</p>

		<p>This indicator can be measured as follows:</p> <ul style="list-style-type: none">• The website is attractive in terms of innovation in design.• The website has beauty in pictures and movements.• The website has a passionate impact so that the user is excited to visit it. <p>2.2 suitability: Design suitability and images used for the type of service provided by the website, can measure this indicator is as follows:</p> <ul style="list-style-type: none">• Design is appropriate for the type of service provided by the website.• Images used on site are appropriate for the nature of the website.• Balance the distribution of images, text, and colors within a single page.• The number of screens per page is reasonable. <p>2.3 multimedia: The properties of video, audio and images files used in pages location. This indicator can be measured according to the following items:</p> <ul style="list-style-type: none">• Uses as few video, audio, and image files as possible within the website.• The size of the video, audio and image files are small so that it does not affect the page load speed.
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		<ul style="list-style-type: none"> • Uses the texts accompanying all video, audio and image files to see their subject in if it is difficult to load. <p>2.4 Color: The color properties used as backgrounds or colors of the same text when designing. Can measure this indicator is as follows:</p> <ul style="list-style-type: none"> • Use light colors as backgrounds. • Do not use more than four colors for text within any page on the website. <p>2.5 Text: The properties of the text used in the pages of the website. This indicator can be measured by items:-</p> <ul style="list-style-type: none"> • Uses one font, one size and the same attribute on one page except titles. • The fonts used make it easy to see and size. • Do not use uppercase for all text except in titles.
3	Quality of organization	<p>3.1 Index: The website contains an index or links that help the user to navigate from all pages website from home page.</p> <p>3.2 Logo: Display the logo of the company or organization in a clear place on each page of the website.</p> <p>3.3 Ease of use: easy to use website, find information, and browse it. This indicator can be measured by</p> <p>The following items:</p> <ul style="list-style-type: none"> • Ease of use, understanding and handling of the

		<p>website.</p> <ul style="list-style-type: none"> • Ease of finding information and browsing the web site. • Easy finding the website from search engines.
4	Quality of usability	<p>4.1 Reliability: Suitable address and website characteristics for its nature. This indicator can be measured by items:</p> <ul style="list-style-type: none"> • Shorten the loading time of the website. • The website works correctly using different monitor modes. • The website has as few ads as possible to avoid the length of the load. • There is a counter to determine the number of users of the website in a particular period. • The website provides all services without interruption at any time of the day or night. <p>4.2 Operability</p> <ul style="list-style-type: none"> • The website supports browsing with more than one browser. <p>4.3 Fault tolerance</p> <ul style="list-style-type: none"> • The website should work well with bugs <p>4.4 Resource utilization</p> <ul style="list-style-type: none"> • The website should use the best use of the device's memory.
5	Quality of functionality	<p>5.1 Security and privacy: To gain user confidence through</p>

		<p>the security of processes and services provided, in addition to maintaining the privacy of personal information. This indicator can be measured by items:</p> <ul style="list-style-type: none"> • The website maintains the security of its operations and services. • The website maintains the privacy of the user's personal information. <p>5.2 Recoverability</p> <ul style="list-style-type: none"> • The website support retrieval of files and databases if they are lost. <p>5.3 Interoperability</p> <ul style="list-style-type: none"> • The website supports sharing and integration with other systems.
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Table [3.2.1] above represent proposed framework

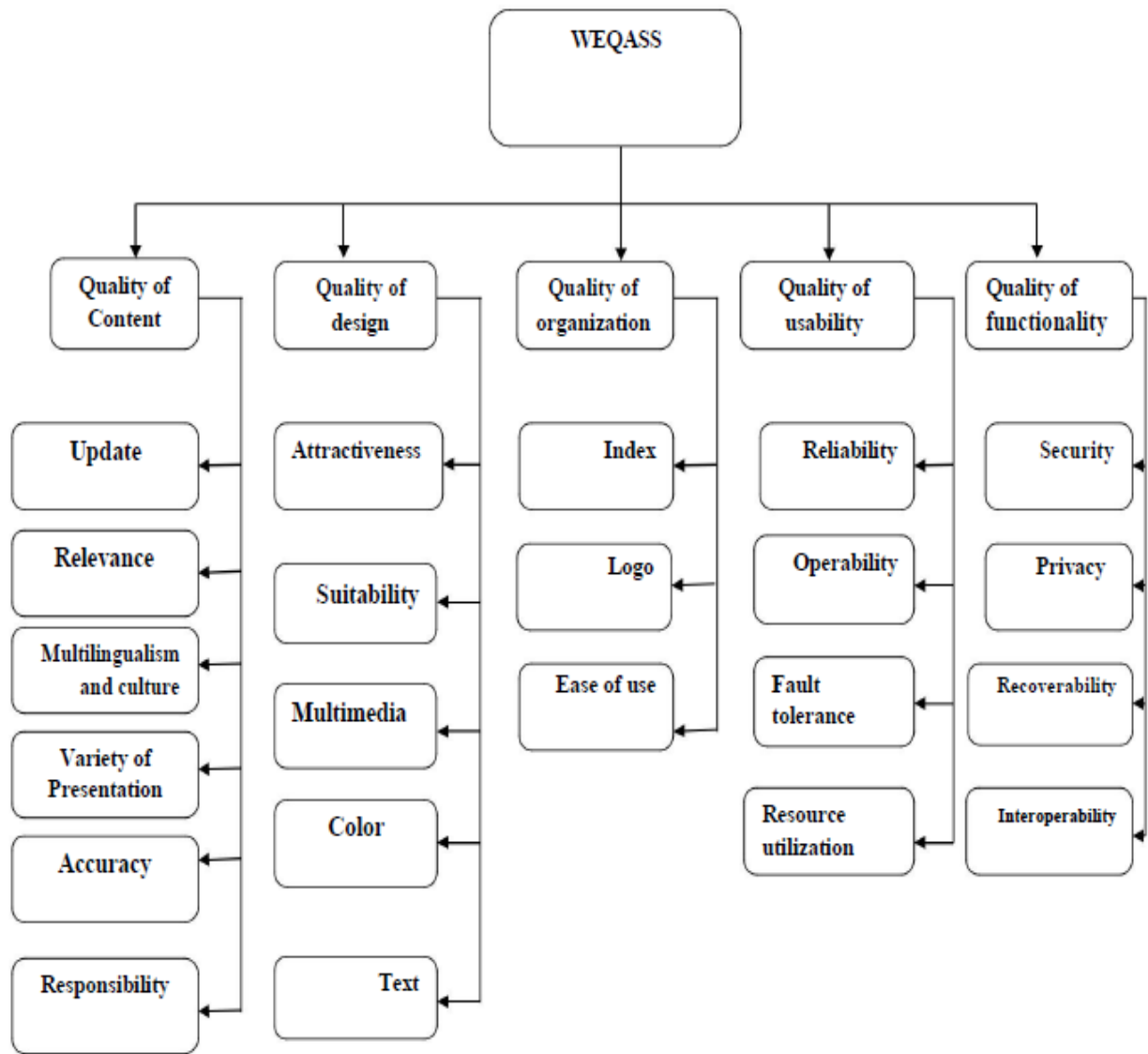


Figure [3.2.2] represent proposal framework [WEQASS]

3.3 Rating of indicators

Value	Description
2	Quality indicator is excellent
1	Quality indicator is good
0	There is no quality

Table [3.3] above represent rating of indicators

3.4 Tools:

The checklist method was used in this research to evaluate the quality of the selected websites.

3.5 The selected websites for evaluation :

- National Civil Service Selection Commission
- Sudan E- Government Portal
- Sudan University for Science and Technology
- Ministry of Higher Education and Scientific Research
- The social networking site Facebook

1. National Civil Service Selection Commission



• URL: <http://www.sudareboard.gov.sd>



Figure [3.5.1] represent template for National Civil Service Selection Commission website.

2. Sudan E- Government Portal

- URL:<http://www.esudan.gov.sd>



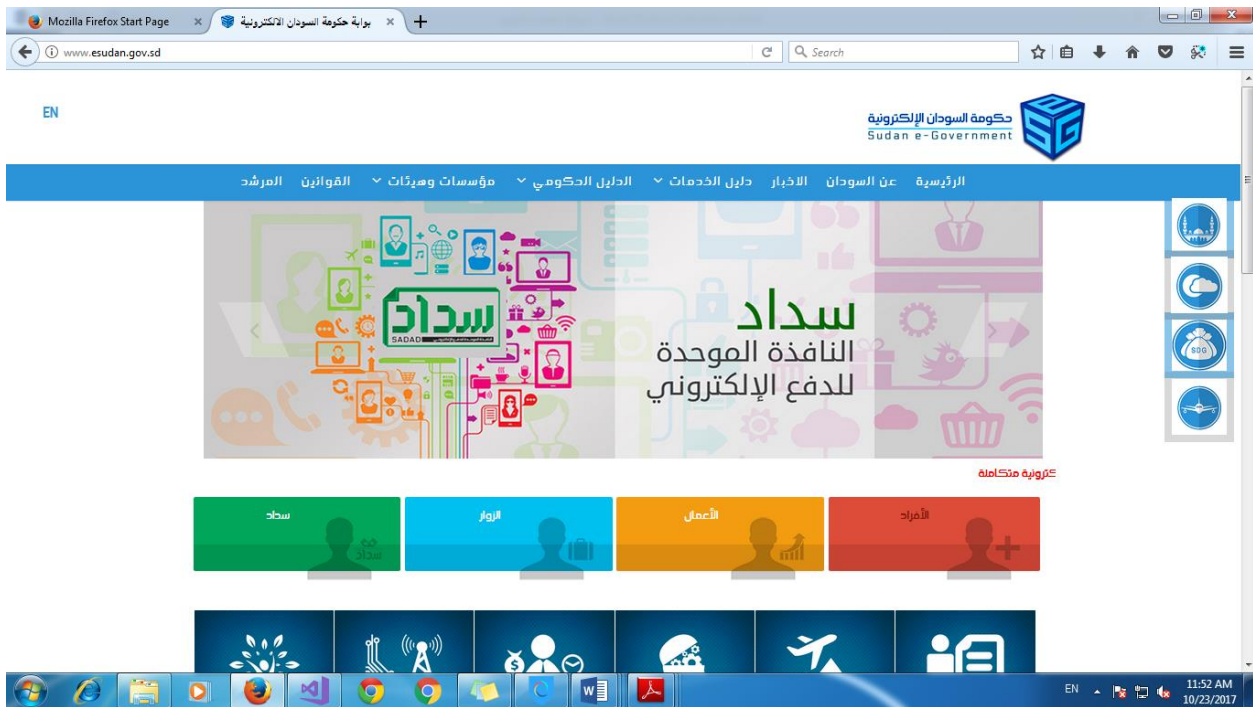


Figure [3.5.2] represent template for Sudan E- Government Portal website

3. Sudan University for Science and Technology

<http://www.sustech.edu/>



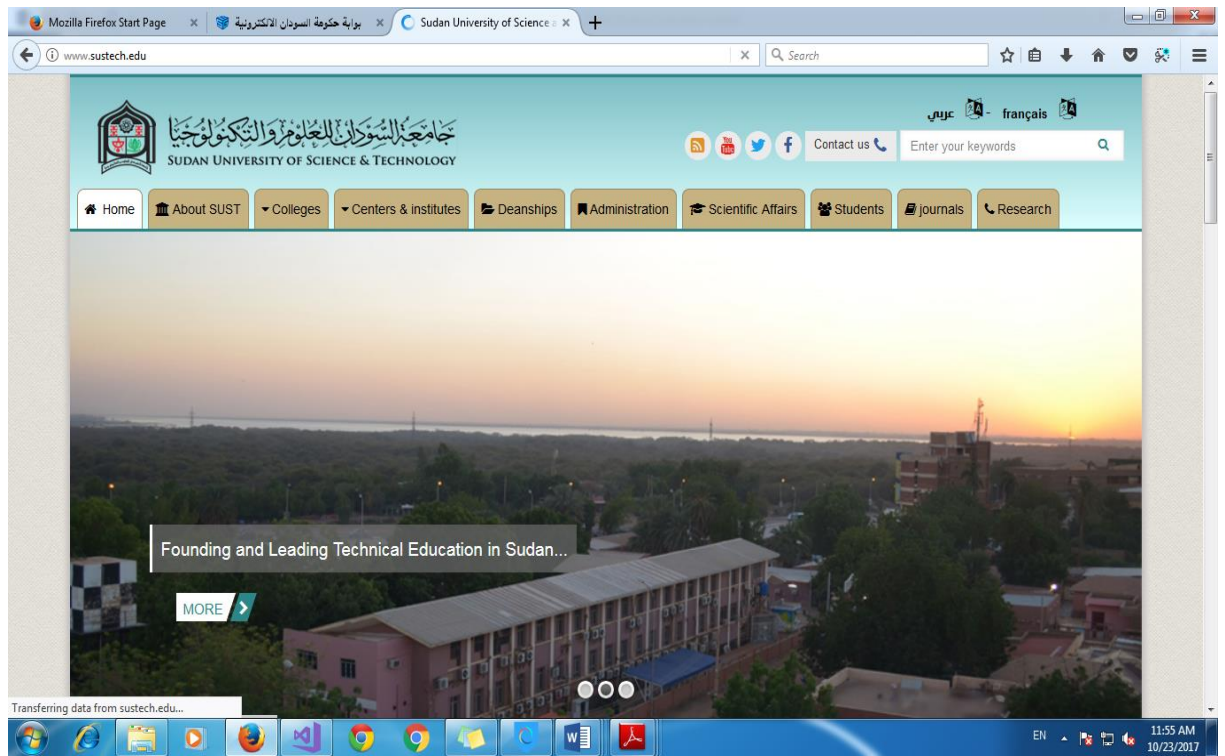


Figure [3.5.3] represent template for Sudan University for Science and Technology website

4. Ministry of Higher Education and Scientific Research

- URL: [http:// www.mohe.gov.sd](http://www.mohe.gov.sd)



Figure [3.5.4] represent template for Ministry of Higher Education and Scientific Research website

5. The social networking site Facebook

<https://www.facebook.com>



Figure [3.5.5] represent template for the social networking website Facebook

Chapter four

4. Results and discussions

4.1 Results:

$$Q = (M/N)*100$$

Where Q= quality of website

M= total number of sub criteria weights for specific website

N= total number of indicators weights for specific website

The framework was used to evaluate the quality of the websites selected and we obtained the following results:

1. National Civil Service Selection Commission

Criteria	indicators	Weights
Quality of content	Update:	
	<ul style="list-style-type: none">Information on the website is up to date.	2
	<ul style="list-style-type: none">The number of update rates within a specified time period, reasonable.	0
	<ul style="list-style-type: none">The clarity of the user's last updated time	0
	Total 33%	
	Relevance	
	<ul style="list-style-type: none">The website contains information about the organization's objectives.	2
	<ul style="list-style-type: none">The website contains information about the establishment of the institution.	2

	<ul style="list-style-type: none"> The website contains information about the beneficiaries of the institution. 	2
	<ul style="list-style-type: none"> The website contains information about the products or services provided by the organization. 	2
	<ul style="list-style-type: none"> The website contains an explanatory picture of the institution. 	2
Total 100%		
Multilingualism and culture		
	<ul style="list-style-type: none"> Browsing is available in more than one language 	0
	<ul style="list-style-type: none"> Consider the different culture of users regardless of the state to which they belong. 	2
Total 50%		
Variety of presentation style		
	<ul style="list-style-type: none"> The website contains text files. 	2
	<ul style="list-style-type: none"> The website contains audio files. 	0
	<ul style="list-style-type: none"> The website contains video files. 	0
	<ul style="list-style-type: none"> The website contains image files. 	2
Total 50%		
Accuracy		
	<ul style="list-style-type: none"> Accuracy of the information on the website. 	2
	<ul style="list-style-type: none"> There are no grammatical or linguistic errors 	2

	on the website.	
	<ul style="list-style-type: none"> Sources of information on the website are reliable. 	2
Total 100%		
Responsibility		
	<ul style="list-style-type: none"> The physical address of the institution is available on the website. 	2
	<ul style="list-style-type: none"> Information on senior management with the functional status of the administrators. 	0
	<ul style="list-style-type: none"> There is information about the copyright of the website. 	2
	<ul style="list-style-type: none"> There is an e-mail to the site owners to contact them 	2
Total	68%	

criteria	indicators	Weights
	Attractiveness:	
Quality of design	<ul style="list-style-type: none"> The website is attractive in terms of innovation in design. 	1
	<ul style="list-style-type: none"> The website has beauty in pictures and movements. 	1
	<ul style="list-style-type: none"> The website has a passionate impact so that the user is excited to visit it. 	1

Total 50%	
suitability:	
• Design is appropriate for the type of service provided by the website.	2
• Images used on site are appropriate for the nature of the website.	2
• Balance the distribution of images, text, and colors within a single page.	2
• The number of screens per page is reasonable.	2
Total 100%	
multimedia:	
• Uses as few video, audio, and image files as possible within the website.	2
• The size of the video, audio and image files are small so that it does not affect the page load speed.	2
• Uses the texts accompanying all video, audio and image files to see their subject in if it is difficult to load.	2
Total 100%	
Color:	
• Use light colors as backgrounds.	2
• Do not use more than four colors for text within	2

	any page on the website.	
	Total 100%	
	Text:	
	<ul style="list-style-type: none"> • Uses one font, one size and the same attribute on one page except titles. 	2
	<ul style="list-style-type: none"> • The fonts used make it easy to see and size. 	2
	<ul style="list-style-type: none"> • Do not use uppercase for all text except in titles. 	2
	Total 100%	
Total	90%	
Quality of organization	Index:	
	<ul style="list-style-type: none"> • The website contains an index or links that help the user to navigate from all pages website from home page. 	2
	Total 100%	
	Logo:	
	<ul style="list-style-type: none"> • Display the logo of the company or organization in a clear place on each page of the website. 	2
	Total 100%	
	Ease of use:	
	<ul style="list-style-type: none"> • Ease of use, understanding and handling of the website. 	2
	<ul style="list-style-type: none"> • Ease of finding information and browsing the 	2

	website.		
	<ul style="list-style-type: none"> • Easy finding the website from search engines. 	2	
	Total 100%		
Total	100%		
Reliability:			
Quality of usability	<ul style="list-style-type: none"> • Shorten the loading time of the website. 	0	
	<ul style="list-style-type: none"> • The website works correctly using different monitor modes. 	2	
	<ul style="list-style-type: none"> • The website has as few ads as possible to avoid the length of the load. 	2	
	<ul style="list-style-type: none"> • There is a counter to determine the number of users of the website in a particular period. 	0	
	<ul style="list-style-type: none"> • The website provides all services without interruption at any time of the day or night. 	0	
	Total 40%		
	Operability:		
	<ul style="list-style-type: none"> • The website supports browsing with more than one browser. 	2	
	Total 100%		
	Fault tolerance:		
<ul style="list-style-type: none"> • The website should work well with bugs 	0		
Total 0%			
Resource utilization:			
<ul style="list-style-type: none"> • The website should use the best use of the 	0		

	device's memory.	
	Total 0%	
Total	35%	
Quality of functionality	Security and privacy:	
	<ul style="list-style-type: none"> The website maintains the security of its operations and services. 	0
	<ul style="list-style-type: none"> The website maintains the privacy of the user's personal information. 	2
	Total 50%	
	Recoverability:	
	<ul style="list-style-type: none"> The website support retrieval of files and databases if they are lost. 	2
	Total 100%	
	Interoperability:	
	<ul style="list-style-type: none"> The website supports sharing and integration with other systems. 	0
	Total 0%	
Total	50%	

Table [4.1.1] represents the evaluation outcome for national civil service selection commission website.

2. Sudan E- Government Portal

criteria	indicators	Weights	
Quality of content	Update:		
	<ul style="list-style-type: none"> Information on the website is up to date. 	2	
	<ul style="list-style-type: none"> The number of update rates within a specified time period, reasonable. 	0	
	<ul style="list-style-type: none"> The clarity of the user's last updated time 	0	
	Total 33%		
	Relevance		
	<ul style="list-style-type: none"> The website contains information about the organization's objectives. 	2	
	<ul style="list-style-type: none"> The website contains information about the establishment of the institution. 	2	
	<ul style="list-style-type: none"> The website contains information about the beneficiaries of the institution. 	2	
	<ul style="list-style-type: none"> The website contains information about the products or services provided by the organization. 	2	
	<ul style="list-style-type: none"> The website contains an explanatory picture of the institution. 	2	
	Total 100%		
	Multilingualism and culture		
	<ul style="list-style-type: none"> Browsing is available in more than one 	2	

	language	
	<ul style="list-style-type: none"> Consider the different culture of users regardless of the state to which they belong. 	2
Total 100%		
Variety of presentation style		
	<ul style="list-style-type: none"> The website contains text files. 	2
	<ul style="list-style-type: none"> The website contains audio files. 	0
	<ul style="list-style-type: none"> The website contains video files. 	0
	<ul style="list-style-type: none"> The website contains image files. 	2
Total 50%		
Accuracy		
	<ul style="list-style-type: none"> Accuracy of the information on the website. 	2
	<ul style="list-style-type: none"> There are no grammatical or linguistic errors on the website. 	2
	<ul style="list-style-type: none"> Sources of information on the website are reliable. 	2
Total 100%		
Responsibility		
	<ul style="list-style-type: none"> The physical address of the institution is available on the website. 	2
	<ul style="list-style-type: none"> Information on senior management with the functional status of the administrators. 	0
	<ul style="list-style-type: none"> There is information about the copyright of 	2

	the website.	
	<ul style="list-style-type: none"> • There is an e-mail to the website owners to contact them 	2
Total	76%	

criteria	indicators	Weights	
Quality of design	Attractiveness:		
	<ul style="list-style-type: none"> • The website is attractive in terms of innovation in design. 	1	
	<ul style="list-style-type: none"> • The website has beauty in pictures and movements. 	1	
	<ul style="list-style-type: none"> • The website has a passionate impact so that the user is excited to visit it. 	1	
	Total 50%		
	suitability:		
	<ul style="list-style-type: none"> • Design is appropriate for the type of service provided by the website. 	2	
	<ul style="list-style-type: none"> • Images used on website are appropriate for the nature of the website. 	2	
	<ul style="list-style-type: none"> • Balance the distribution of images, text, and colors within a single page. 	2	
	<ul style="list-style-type: none"> • The number of screens per page is reasonable. 	2	
	Total 100%		

	multimedia:	
	<ul style="list-style-type: none"> • Uses as few video, audio, and image files as possible within the website. 	2
	<ul style="list-style-type: none"> • The size of the video, audio and image files are small so that it does not affect the page load speed. 	1
	<ul style="list-style-type: none"> • Uses the texts accompanying all video, audio and image files to see their subject in if it is difficult to load. 	2
	Total 83%	
	Color:	
	<ul style="list-style-type: none"> • Use light colors as backgrounds. 	2
	<ul style="list-style-type: none"> • Do not use more than four colors for text within any page on the website. 	2
	Total 100%	
	Text:	
	<ul style="list-style-type: none"> • Uses one font, one size and the same attribute on one page except titles. 	2
	<ul style="list-style-type: none"> • The fonts used make it easy to see and size. 	2
	<ul style="list-style-type: none"> • Do not use uppercase for all text except in titles. 	2
	Total 100%	
	Total 90%	
Total	90%	

Quality of organization	Index:	
	<ul style="list-style-type: none"> The website contains an index or links that help the user to navigate from all pages website from home page. 	2
	Total 100%	
	Logo:	
	<ul style="list-style-type: none"> Display the logo of the company or organization in a clear place on each page of the website. 	2
	Total 100%	
	Ease of use:	
	<ul style="list-style-type: none"> Ease of use, understanding and handling of the website. 	2
	<ul style="list-style-type: none"> Ease of finding information and browsing the website. 	2
	<ul style="list-style-type: none"> Easy finding the website from search engines. 	2
	Total 100%	
Total	100%	
	Reliability:	
	<ul style="list-style-type: none"> Shorten the loading time of the website. 	0

Quality of usability	<ul style="list-style-type: none"> The website works correctly using different monitor modes. 	2
	<ul style="list-style-type: none"> The website has as few ads as possible to avoid the length of the load. 	2
	<ul style="list-style-type: none"> There is a counter to determine the number of users of the website in a particular period. 	0
	<ul style="list-style-type: none"> The website provides all services without interruption at any time of the day or night. 	0
	Total 40%	
	Operability:	
	<ul style="list-style-type: none"> The website supports browsing with more than one browser. 	2
	Total 100%	
	Fault tolerance:	
	<ul style="list-style-type: none"> The website should work well with bugs 	0
	Total 0%	
	Resource utilization:	
	<ul style="list-style-type: none"> The website should use the best use of the device's memory. 	0
	Total 0%	
Total	35%	
Quality of	Security and privacy:	

functionality	<ul style="list-style-type: none"> The website maintains the security of its operations and services. 	0
	<ul style="list-style-type: none"> The website maintains the privacy of the user's personal information. 	2
	Total 50%	
	Recoverability:	
	<ul style="list-style-type: none"> The website support retrieval of files and databases if they are lost. 	2
	Total 100%	
	Interoperability:	
	<ul style="list-style-type: none"> The website supports sharing and integration with other systems. 	2
Total 0%		
Total	50%	

Table [4.1.2] represents the evaluation outcome for Sudan E- Government Portal website

3. Sudan University for Science and Technology

criteria	indicators	Weights	
Quality of content	Update:		
	<ul style="list-style-type: none"> Information on the website is up to date. 	2	
	<ul style="list-style-type: none"> The number of update rates within a specified time period, reasonable. 	0	
	<ul style="list-style-type: none"> The clarity of the user's last updated time 	0	
	Total 33%		
	Relevance		
	<ul style="list-style-type: none"> The website contains information about the organization's objectives. 	2	
	<ul style="list-style-type: none"> The website contains information about the establishment of the institution. 	2	
	<ul style="list-style-type: none"> The website contains information about the beneficiaries of the institution. 	2	
	<ul style="list-style-type: none"> The website contains information about the products or services provided by the organization. 	2	
	<ul style="list-style-type: none"> The website contains an explanatory picture of the institution. 	2	
	Total 100%		
	Multilingualism and culture		
	<ul style="list-style-type: none"> Browsing is available in more than one 	2	

	language	
	<ul style="list-style-type: none"> Consider the different culture of users regardless of the state to which they belong. 	2
Total 50%		
Variety of presentation style		
	<ul style="list-style-type: none"> The website contains text files. 	2
	<ul style="list-style-type: none"> The website contains audio files. 	0
	<ul style="list-style-type: none"> The website contains video files. 	0
	<ul style="list-style-type: none"> The website contains image files. 	2
Total 50%		
Accuracy		
	<ul style="list-style-type: none"> Accuracy of the information on the website. 	2
	<ul style="list-style-type: none"> There are no grammatical or linguistic errors on the website. 	2
	<ul style="list-style-type: none"> Sources of information on the website are reliable. 	2
Total 100%		
Responsibility		
	<ul style="list-style-type: none"> The physical address of the institution is available on the website. 	2
	<ul style="list-style-type: none"> Information on senior management with the functional status of the administrators. 	0
	<ul style="list-style-type: none"> There is information about the copyright of 	2

	the website.	
	<ul style="list-style-type: none"> • There is an e-mail to the website owners to contact them 	2
Total	68%	

criteria	indicators	Weights	
Quality of design	Attractiveness:		
	<ul style="list-style-type: none"> • The website is attractive in terms of innovation in design. 	1	
	<ul style="list-style-type: none"> • The website has beauty in pictures and movements. 	1	
	<ul style="list-style-type: none"> • The website has a passionate impact so that the user is excited to visit it. 	1	
	Total 50%		
	suitability:		
	<ul style="list-style-type: none"> • Design is appropriate for the type of service provided by the website. 	2	
	<ul style="list-style-type: none"> • Images used on site are appropriate for the nature of the website. 	2	
	<ul style="list-style-type: none"> • Balance the distribution of images, text, and colors within a single page. 	2	
	<ul style="list-style-type: none"> • The number of screens per page is reasonable. 	2	
	Total 100%		

	multimedia:	
	<ul style="list-style-type: none"> • Uses as few video, audio, and image files as possible within the website. 	2
	<ul style="list-style-type: none"> • The size of the video, audio and image files are small so that it does not affect the page load speed. 	2
	<ul style="list-style-type: none"> • Uses the texts accompanying all video, audio and image files to see their subject in if it is difficult to load. 	2
	Total 100%	
	Color:	
	<ul style="list-style-type: none"> • Use light colors as backgrounds. 	2
	<ul style="list-style-type: none"> • Do not use more than four colors for text within any page on the website. 	2
	Total 100%	
	Text:	
	<ul style="list-style-type: none"> • Uses one font, one size and the same attribute on one page except titles. 	2
	<ul style="list-style-type: none"> • The fonts used make it easy to see and size. 	2
	<ul style="list-style-type: none"> • Do not use uppercase for all text except in titles. 	2
	Total 100%	
Total	90%	

Quality of organization	Index:	
	<ul style="list-style-type: none"> The website contains an index or links that help the user to navigate from all pages website from home page. 	2
	Total 100%	
	Logo:	
	<ul style="list-style-type: none"> Display the logo of the company or organization in a clear place on each page of the website. 	2
	Total 100%	
	Ease of use:	
	<ul style="list-style-type: none"> Ease of use, understanding and handling of the website. 	2
	<ul style="list-style-type: none"> Ease of finding information and browsing the website. 	2
	<ul style="list-style-type: none"> Easy finding the website from search engines. 	2
	Total 100%	
Total	100%	
Quality of usability	Reliability:	
	<ul style="list-style-type: none"> Shorten the loading time of the website. 	0
	<ul style="list-style-type: none"> The website works correctly using different monitor modes. 	2

	<ul style="list-style-type: none"> The website has as few ads as possible to avoid the length of the load. 	2
	<ul style="list-style-type: none"> There is a counter to determine the number of users of the website in a particular period. 	0
	<ul style="list-style-type: none"> The website provides all services without interruption at any time of the day or night. 	0
	Total 40%	
	Operability:	
	<ul style="list-style-type: none"> The website supports browsing with more than one browser. 	2
	Total 100%	
	Fault tolerance:	
	<ul style="list-style-type: none"> The website should work well with bugs 	0
	Total 0%	
	Resource utilization:	
	<ul style="list-style-type: none"> The website should use the best use of the device's memory. 	0
	Total 0%	
	Total 35%	
Quality of functionality	Security and privacy:	
	<ul style="list-style-type: none"> The website maintains the security of its operations and services. 	0
	<ul style="list-style-type: none"> The website maintains the privacy of the user's 	2

	personal information.	
	Total 50%	
	Recoverability:	
	<ul style="list-style-type: none"> The website support retrieval of files and databases if they are lost. 	2
	Total 100%	
	Interoperability:	
	<ul style="list-style-type: none"> The website supports sharing and integration with other systems. 	0
	Total 0%	
Total	50%	

Table [4.1.3] represents the evaluation outcome for Sudan University for Science and Technology website

4. Ministry of Higher Education and Scientific Research

criteria	indicators	Weights	
Quality of content	Update:		
	<ul style="list-style-type: none"> Information on the website is up to date. 	2	
	<ul style="list-style-type: none"> The number of update rates within a specified time period, reasonable. 	0	
	<ul style="list-style-type: none"> The clarity of the user's last updated time 	0	
	Total 33%		
	Relevance		
	<ul style="list-style-type: none"> The website contains information about the organization's objectives. 	2	
	<ul style="list-style-type: none"> The website contains information about the establishment of the institution. 	2	
	<ul style="list-style-type: none"> The website contains information about the beneficiaries of the institution. 	2	
	<ul style="list-style-type: none"> The website contains information about the products or services provided by the organization. 	2	
	<ul style="list-style-type: none"> The website contains an explanatory picture of the institution. 	2	
	Total 100%		
	Multilingualism and culture		
	<ul style="list-style-type: none"> Browsing is available in more than one language 	2	

	<ul style="list-style-type: none"> Consider the different culture of users regardless of the state to which they belong. 	2
Total 100%		
Variety of presentation style		
	<ul style="list-style-type: none"> The website contains text files. 	2
	<ul style="list-style-type: none"> The website contains audio files. 	0
	<ul style="list-style-type: none"> The website contains video files. 	0
	<ul style="list-style-type: none"> The website contains image files. 	2
Total 50%		
Accuracy		
	<ul style="list-style-type: none"> Accuracy of the information on the website. 	2
	<ul style="list-style-type: none"> There are no grammatical or linguistic errors on the website. 	2
	<ul style="list-style-type: none"> Sources of information on the website are reliable. 	2
Total 100%		
Responsibility		
	<ul style="list-style-type: none"> The physical address of the institution is available on the website. 	0
	<ul style="list-style-type: none"> Information on senior management with the functional status of the administrators. 	1
	<ul style="list-style-type: none"> There is information about the copyright of the website. 	2

	<ul style="list-style-type: none"> There is an e-mail to the website owners to contact them 	2
	62.5%	
Total	74%	

criteria	indicators	Weights
Quality of design	Attractiveness:	
	<ul style="list-style-type: none"> The website is attractive in terms of innovation in design. 	1
	<ul style="list-style-type: none"> The website has beauty in pictures and movements. 	1
	<ul style="list-style-type: none"> The website has a passionate impact so that the user is excited to visit it. 	0
	Total 33%	
	suitability:	
	<ul style="list-style-type: none"> Design is appropriate for the type of service provided by the website. 	2
	<ul style="list-style-type: none"> Images used on website are appropriate for the nature of the website. 	2
	<ul style="list-style-type: none"> Balance the distribution of images, text, and colors within a single page. 	2
	<ul style="list-style-type: none"> The number of screens per page is reasonable. 	2
	Total 100%	

	multimedia:	
	<ul style="list-style-type: none"> • Uses as few video, audio, and image files as possible within the website. 	2
	<ul style="list-style-type: none"> • The size of the video, audio and image files are small so that it does not affect the page load speed. 	2
	<ul style="list-style-type: none"> • Uses the texts accompanying all video, audio and image files to see their subject in if it is difficult to load. 	2
	Total 100%	
	Color:	
	<ul style="list-style-type: none"> • Use light colors as backgrounds. 	2
	<ul style="list-style-type: none"> • Do not use more than four colors for text within any page on the website. 	2
	Total 100%	
	Text:	
	<ul style="list-style-type: none"> • Uses one font, one size and the same attribute on one page except titles. 	2
	<ul style="list-style-type: none"> • The fonts used make it easy to see and size. 	2
	<ul style="list-style-type: none"> • Do not use uppercase for all text except in titles. 	2
	100%	
Total	86.6%	

Quality of organization	Index:	
	<ul style="list-style-type: none"> The website contains an index or links that help the user to navigate from all pages website from home page. 	2
	Total 100%	
	Logo:	
	<ul style="list-style-type: none"> Display the logo of the company or organization in a clear place on each page of the website. 	2
	Total 100%	
	Ease of use:	
	<ul style="list-style-type: none"> Ease of use, understanding and handling of the website. 	2
	<ul style="list-style-type: none"> Ease of finding information and browsing the website. 	2
	<ul style="list-style-type: none"> Easy finding the website from search engines. 	2
	Total 100%	
Total	100%	
Quality of usability	Reliability:	
	<ul style="list-style-type: none"> Shorten the loading time of the website. 	0
	<ul style="list-style-type: none"> The website works correctly using different monitor modes. 	2
	<ul style="list-style-type: none"> The website has as few ads as possible to avoid 	2

	the length of the load.	
	<ul style="list-style-type: none"> There is a counter to determine the number of users of the website in a particular period. 	0
	<ul style="list-style-type: none"> The website provides all services without interruption at any time of the day or night. 	0
	Total 40%	
	Operability:	
	<ul style="list-style-type: none"> The website supports browsing with more than one browser. 	2
	Total 100%	
	Fault tolerance:	
	<ul style="list-style-type: none"> The website should work well with bugs 	0
	Total 0%	
	Resource utilization:	
	<ul style="list-style-type: none"> The website should use the best use of the device's memory. 	0
	Total 0%	
	Total 35%	
Quality of functionality	Security and privacy:	
	<ul style="list-style-type: none"> The website maintains the security of its operations and services. 	2
	<ul style="list-style-type: none"> The website maintains the privacy of the user's personal information. 	2
	Total 100%	

	Recoverability:	
	<ul style="list-style-type: none"> The website support retrieval of files and databases if they are lost. 	2
	Total 100%	
	Interoperability:	
	<ul style="list-style-type: none"> The website supports sharing and integration with other systems. 	2
	Total 100%	
Total	100%	

Table [4.1.4] represents the evaluation outcome for Ministry of Higher Education and Scientific Research website

5. The social networking website Facebook

criteria	indicators	Weights
Quality of content	Update:	
	<ul style="list-style-type: none"> Information on the website is up to date. 	2
	<ul style="list-style-type: none"> The number of update rates within a specified time period, reasonable. 	2
	<ul style="list-style-type: none"> The clarity of the user's last updated time 	2
	Total 100%	
	Relevance	
	<ul style="list-style-type: none"> The website contains information about the 	2

	organization's objectives.	
	<ul style="list-style-type: none"> The website contains information about the establishment of the institution. 	2
	<ul style="list-style-type: none"> The website contains information about the beneficiaries of the institution. 	2
	<ul style="list-style-type: none"> The website contains information about the products or services provided by the organization. 	2
	<ul style="list-style-type: none"> The website contains an explanatory picture of the institution. 	2
Total 100%		
Multilingualism and culture		
	<ul style="list-style-type: none"> Browsing is available in more than one language 	2
	<ul style="list-style-type: none"> Consider the different culture of users regardless of the state to which they belong. 	2
Total 100%		
Variety of presentation style		
	<ul style="list-style-type: none"> The website contains text files. 	2
	<ul style="list-style-type: none"> The website contains audio files. 	2
	<ul style="list-style-type: none"> The website contains video files. 	2
	<ul style="list-style-type: none"> The website contains image files. 	2
Total 100%		

	Accuracy	
	<ul style="list-style-type: none"> • Accuracy of the information on the website. 	0
	<ul style="list-style-type: none"> • There are no grammatical or linguistic errors on the website. 	2
	<ul style="list-style-type: none"> • Sources of information on the website are reliable. 	0
	Total 33%	
	Responsibility	
	<ul style="list-style-type: none"> • The physical address of the institution is available on the website. 	0
	<ul style="list-style-type: none"> • Information on senior management with the functional status of the administrators. 	0
	<ul style="list-style-type: none"> • There is information about the copyright of the website. 	2
	<ul style="list-style-type: none"> • There is an e-mail to the website owners to contact them 	2
	50%	
Total	80.5%	

criteria	indicators	Weights	
Quality of design	Attractiveness:		
	<ul style="list-style-type: none"> The website is attractive in terms of innovation in design. 	2	
	<ul style="list-style-type: none"> The website has beauty in pictures and movements. 	2	
	<ul style="list-style-type: none"> The website has a passionate impact so that the user is excited to visit it. 	2	
	Total 100%		
	suitability:		
	<ul style="list-style-type: none"> Design is appropriate for the type of service provided by the website. 	2	
	<ul style="list-style-type: none"> Images used on website are appropriate for the nature of the website. 	2	
	<ul style="list-style-type: none"> Balance the distribution of images, text, and colors within a single page. 	2	
	<ul style="list-style-type: none"> The number of screens per page is reasonable. 	2	
	Total 100%		
	multimedia:		
	<ul style="list-style-type: none"> Uses as few video, audio, and image files as possible within the website. 	0	
	<ul style="list-style-type: none"> The size of the video, audio and image files are small so that it does not affect the page load 	0	

	speed.	
	<ul style="list-style-type: none"> • Uses the texts accompanying all video, audio and image files to see their subject in if it is difficult to load. 	2
	Total 33%	
	Color:	
	<ul style="list-style-type: none"> • Use light colors as backgrounds. 	2
	<ul style="list-style-type: none"> • Do not use more than four colors for text within any page on the website. 	2
	Total 100%	
	Text:	
	<ul style="list-style-type: none"> • Uses one font, one size and the same attribute on one page except titles. 	2
	<ul style="list-style-type: none"> • The fonts used make it easy to see and size. 	2
	<ul style="list-style-type: none"> • Do not use uppercase for all text except in titles. 	2
	100%	
Total	86.6%	
Quality of organization	Index:	
	<ul style="list-style-type: none"> • The website contains an index or links that help the user to navigate from all pages website from home page. 	2
	Total 100%	

	Logo:	
	<ul style="list-style-type: none"> • Display the logo of the company or organization in a clear place on each page of the website. 	2
	Total 100%	
	Ease of use:	
	<ul style="list-style-type: none"> • Ease of use, understanding and handling of the website. 	2
	<ul style="list-style-type: none"> • Ease of finding information and browsing the website. 	2
	<ul style="list-style-type: none"> • Easy finding the website from search engines. 	2
	Total 100%	
Total	100%	
Reliability:		
Quality of usability	<ul style="list-style-type: none"> • Shorten the loading time of the website. 	2
	<ul style="list-style-type: none"> • The website works correctly using different monitor modes. 	2
	<ul style="list-style-type: none"> • The website has as few ads as possible to avoid the length of the load. 	2
	<ul style="list-style-type: none"> • There is a counter to determine the number of users of the website in a particular period. 	2
	<ul style="list-style-type: none"> • The website provides all services without interruption at any time of the day or night. 	2
	Total 100%	

	Operability:	
	<ul style="list-style-type: none"> The website supports browsing with more than one browser. 	2
	Total 100%	
	Fault tolerance:	
	<ul style="list-style-type: none"> The website should work well with bugs 	2
	Total 100%	
	Resource utilization:	
	<ul style="list-style-type: none"> The website should use the best use of the device's memory. 	2
	Total 100%	
Total	100%	
Quality of functionality	Security and privacy:	
	<ul style="list-style-type: none"> The website maintains the security of its operations and services. 	2
	<ul style="list-style-type: none"> The website maintains the privacy of the user's personal information. 	2
	Total 100%	
	Recoverability:	
	<ul style="list-style-type: none"> The website support retrieval of files and databases if they are lost. 	2
	Total 100%	
	Interoperability:	

	<ul style="list-style-type: none"> The website supports sharing and integration with other systems. 	2
	Total 100%	
Total	100%	

Table [4.1.5] represents the evaluation outcome for the social networking website facebook

4.2 discussions:

In this section, the results that we obtained when applying the framework were discussed on some of the selected websites which are as follows:

1. National Civil Service Selection Commission

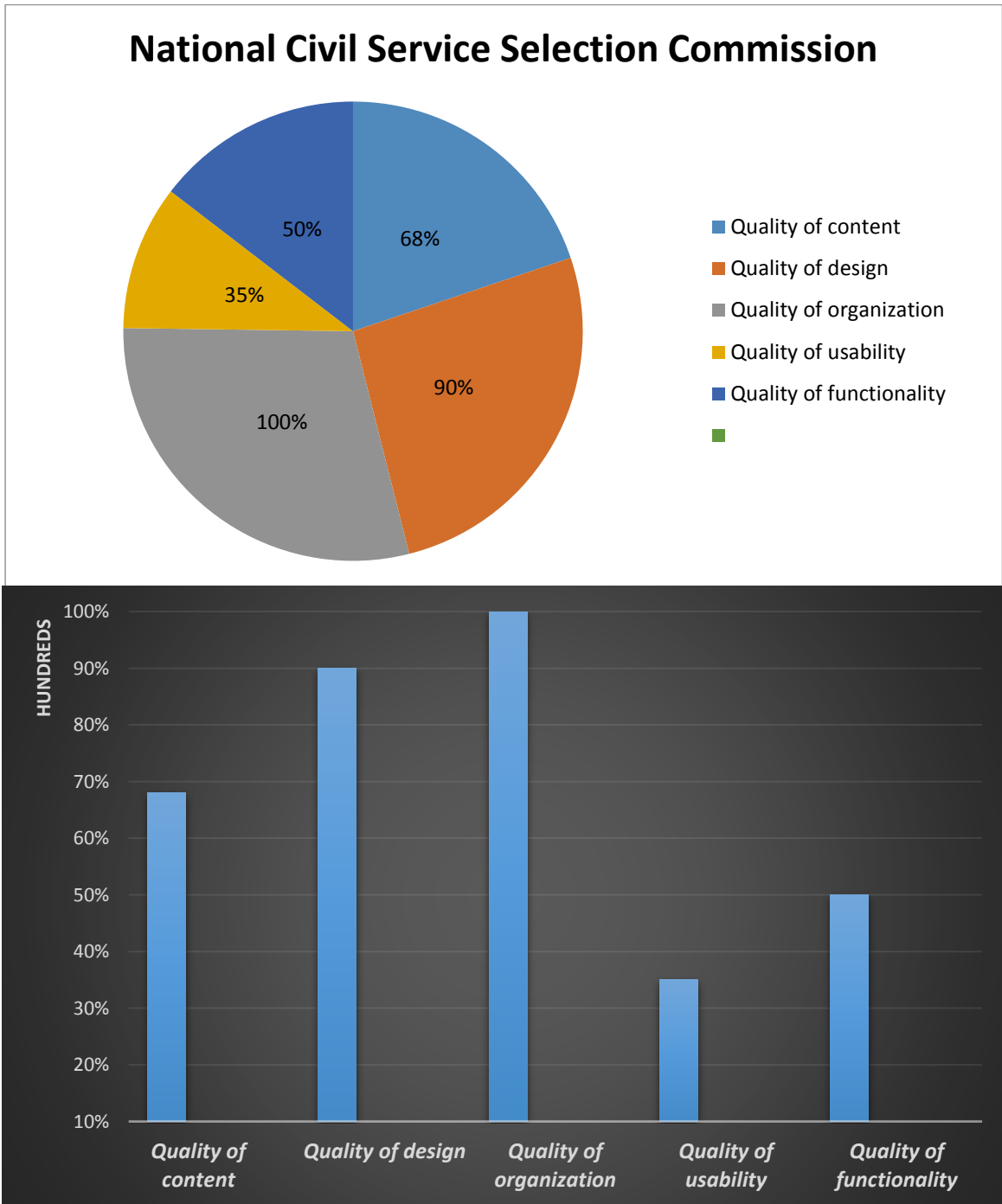


Figure [4.2.1] evaluation for national civil service selection commission website.

2. Sudan E- Government Portal

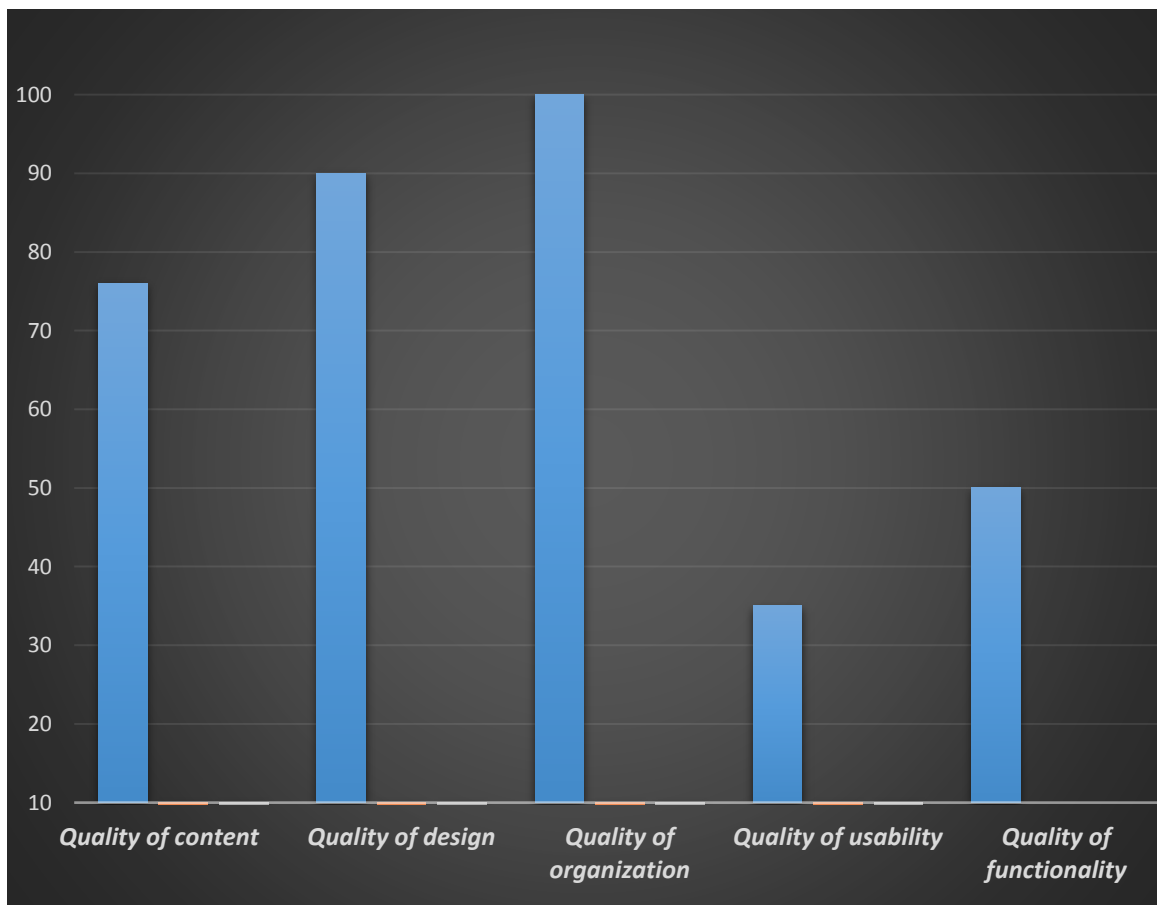
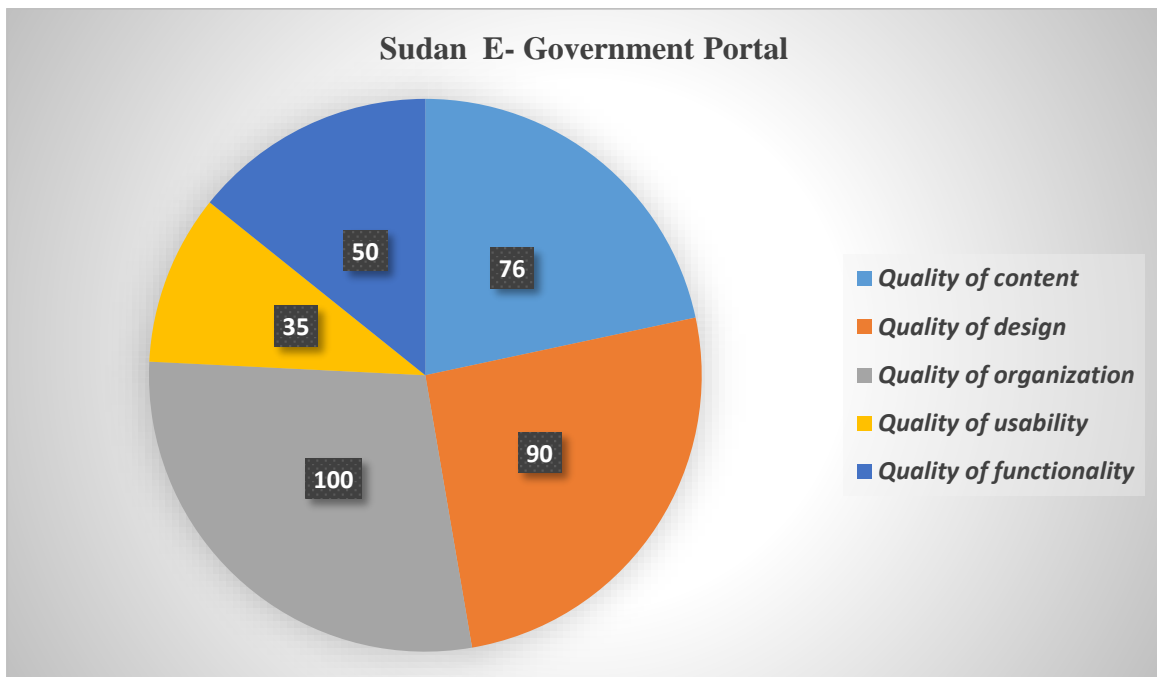


Figure [4.2.2] evaluation for Sudan E- Government Portal website.

3. Sudan University for Science and Technology

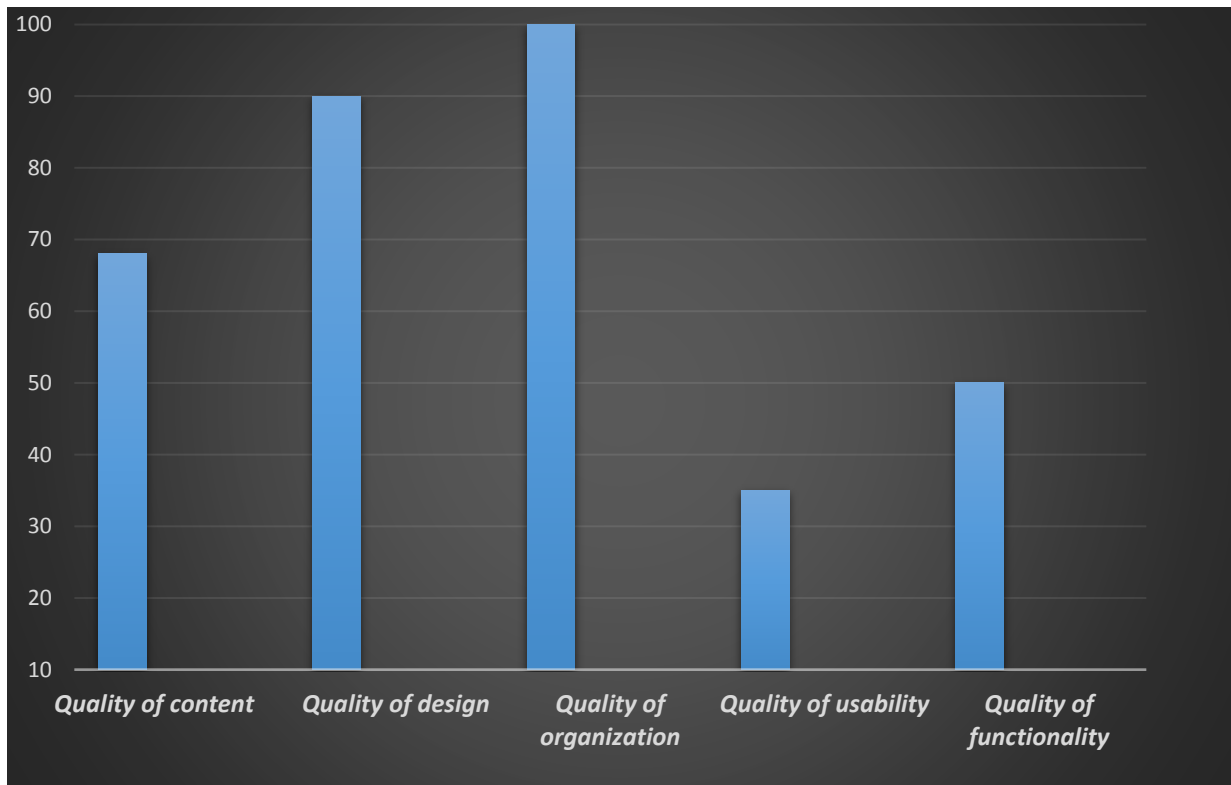
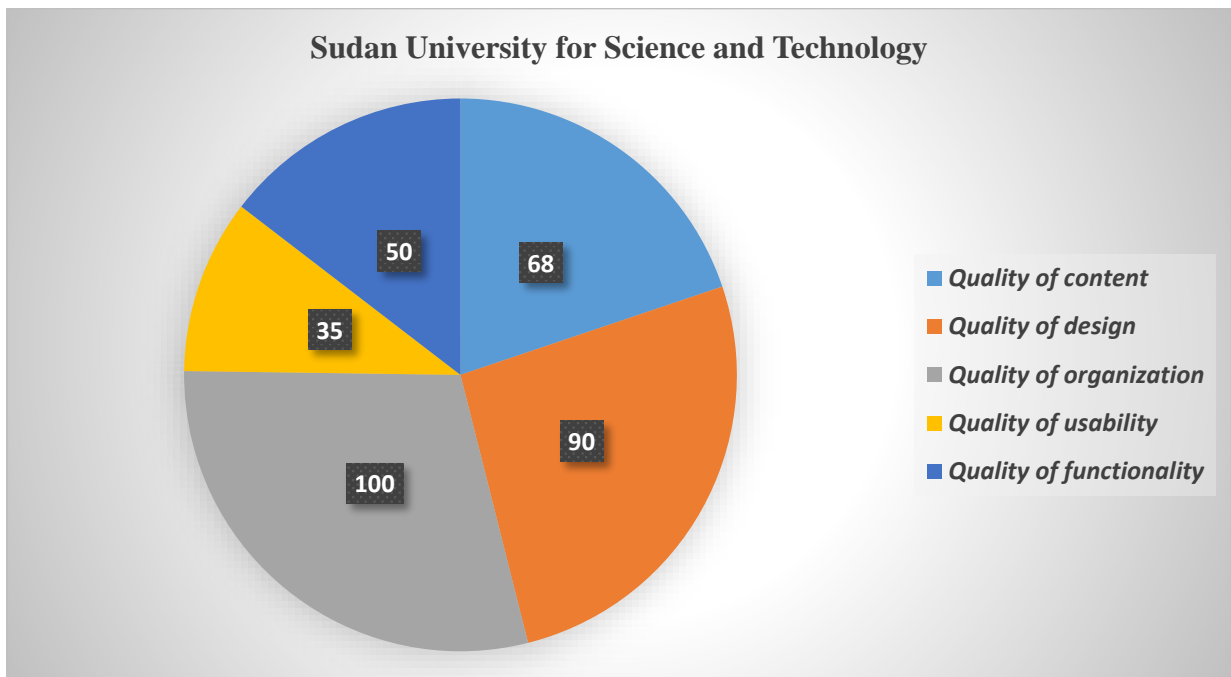


Figure [4.2.3] evaluation for Sudan University for Science and Technology website.

4. Ministry of Higher Education and Scientific Research

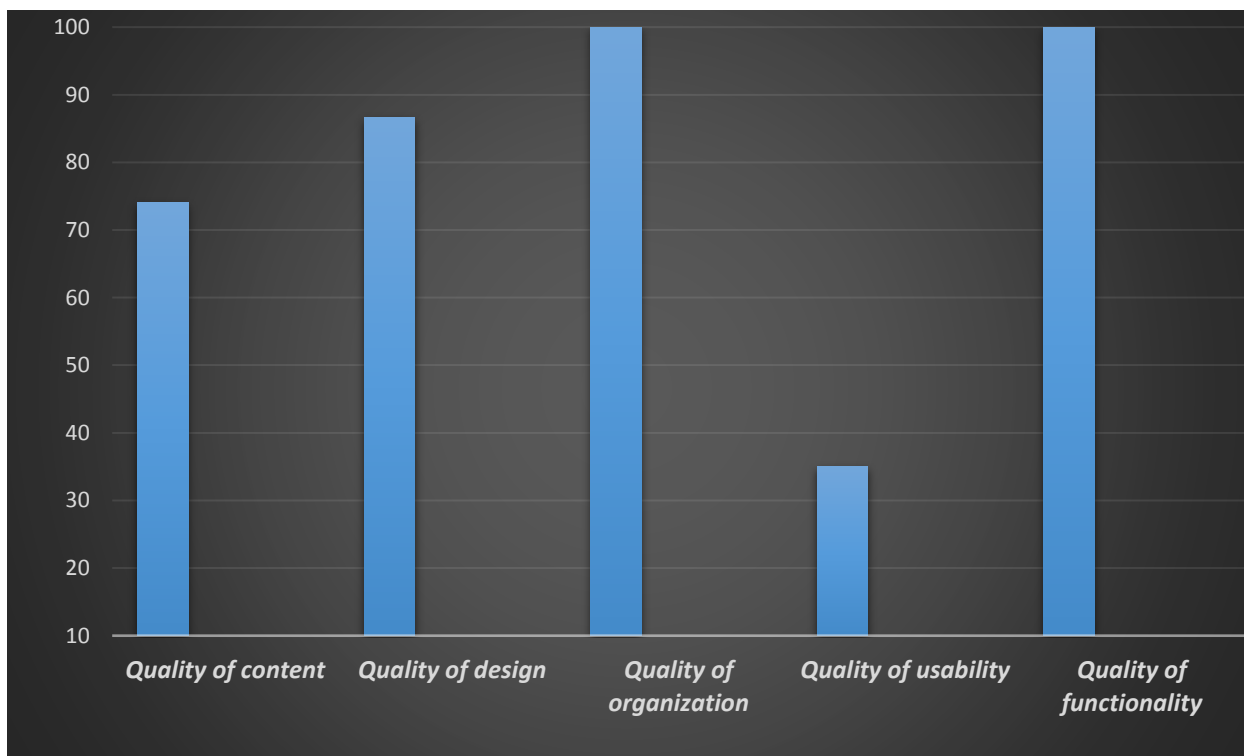
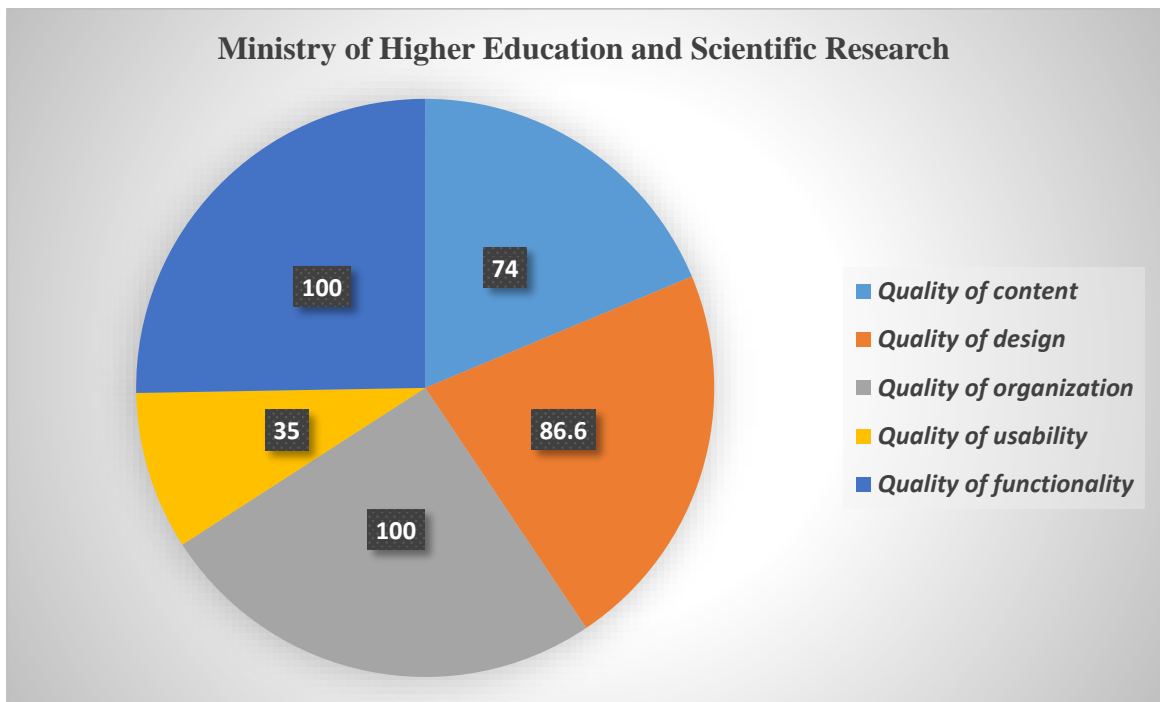


Figure [4.2.4] evaluation for Ministry of Higher Education and Scientific Research website

5. The social networking site Facebook

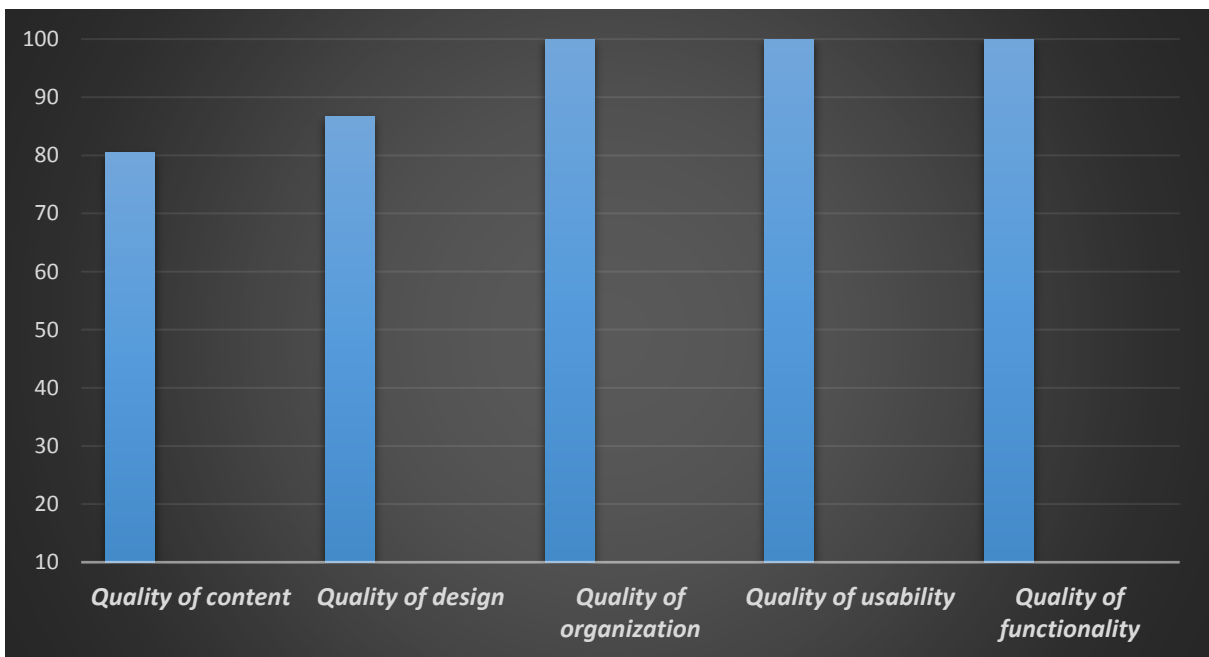
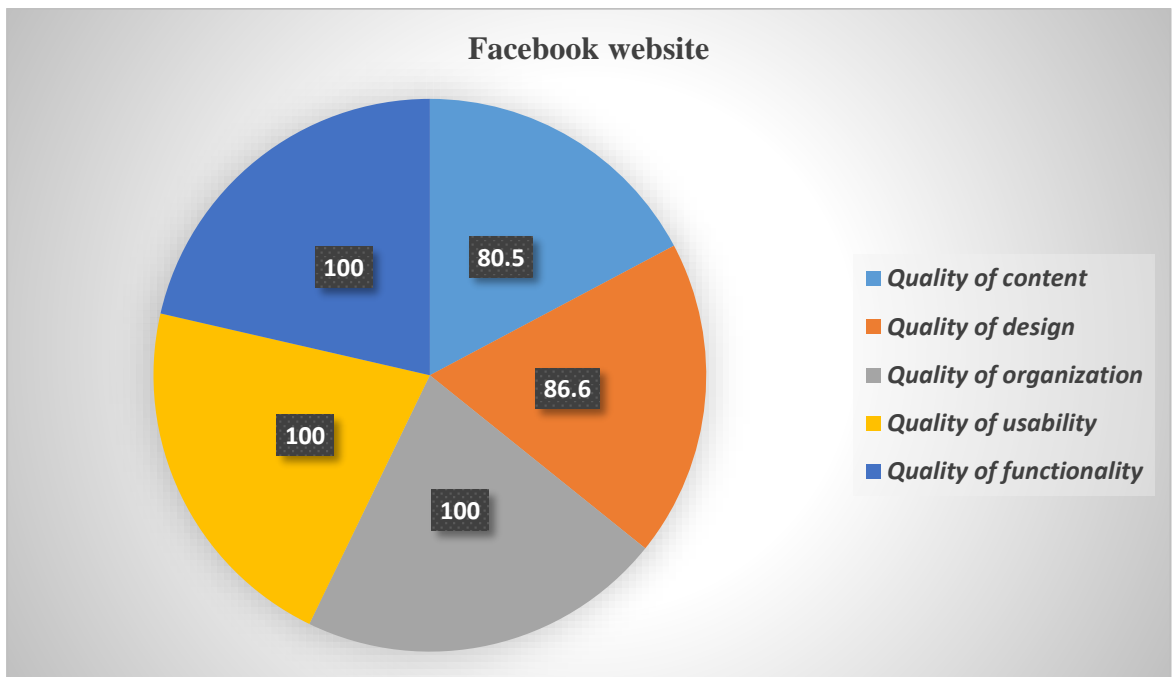


Figure [4.2.5] evaluation for the social networking site Facebook website

Chapter five

5.1 Conclusion

The proposed framework for evaluating the quality of websites and services; measures the efficiency and quality of the website in the provision of electronic services for the enterprises. The proposed framework provides a reference and a guide for designers when designing new websites.

5.2 Recommendations

1. Transform this theoretical framework into an electronic system for assessing the quality of websites.
2. Commitment of the institutions to periodically evaluate the quality of their websites and services.
3. The need for organizations to be concerned about feedback from the process of evaluating websites in order to improve the quality of the website
4. This framework should be considered as a reference and guide for developers and designers of websites.

6.References

- [1] L. Hassan and, E. Abu,” A theoretical framework for evaluating the quality of academic websites”, Arab International Journal of Informatics, vol. I, No. 1, 2012.
- [2] Net craft, “The number of websites”,
<http://www.internetlivestats.com/total-number-of-websites>, 3/2/2018 11:15 PM.
- [3]D. Garvin, “Total Quality Management”, Harvard, 2017.
- [4]Padayachee, P. Kotze, “ISO 9126 external systems quality characteristics and sub- characteristics”,University of South Africa Meraka Institute, 2016.
- [5] Z.Zhou, “evaluating websites using a practical quality model Software Technology”, Research Laboratory De Montfort University, 2009.
- [6] K.Singh, P.Kumar,” Implementation of a Model for Websites Quality Evaluation”,ISSN 2347 – 8616, Volume 3, Issue 1 April 2014.
- [7] I.biscoglio, “Theories and criteria of evaluation “, University of California, 2007.
- [8]M. Mustafa, “Comparative analytical study between some Arab and foreign websites “, Journal of Management and Economics, Sciences, vol. 6, 2018.
- [9] V.Moustakis, C.Litos, A.Dalivigas, L .Tsironis ,” Website Quality Assessment Criteria”,Institute of Computer Science, Foundation for Research and Technology – Hellas, 2004.

- [10] R. Kulkarni, S. Dixit, "Empirical and Automated Analysis of Web Applications", International Journal of Computer Applications, 2012.
- [11] S. Al-Shawabkeh, "Using Internet-based Electronic Resources in Educational Theses and Dissertations", Faculty of Education Sciences, Jordanian University, Amman, Jordan, vol.6, 2014.
- [12] M. Al - Zubeida, M. Younis and A. Siddiqi, "Create a hybrid website for ranking system based on the website quality assessment model", Iraqi Journal of Statistical Sciences, vol.17, 2010,
- [13] H. Chain, S. Kumar, "An Approach of Quality Assurance in Web Application", ISSN 2250-2459, Volume 2, Issue 8, August 2012.
- [14] Y. Liu, "Developing a scale to measure the interactivity of websites", Journal of advertising research, 2003.
- [15] H. Van, d. Heijden, "Factors influencing the usage of websites", journal Information & management, 2003.