Chapter 1

Introduction

Introduction:

In recent years, Website development has been done at a rapid pace for wide ranges of applications in different domains such as government, education, entertainment, business and health. Millions of websites are available today, but a small percentage of those reach the user's need. While analyzing, some of the reasons causative for this problem are pertinent to the rapid progression in web technologies, the simple usage of web-oriented languages and the forbearance of browsers to exhibit incorrect code. Additionally, other reasons may contribute to the problems such as the background of designers and developers for website design. Despite the reality many websites lack in quality and does not satisfy the user requirements; the reliance to use sites for different prospects such as finding information, online shopping, communicating with people or accomplishing other different tasks has amplified. Moreover, it is also been noted that existing websites in variant domains have become application-oriented and merely not document-oriented. As a result, there is an increase in complex development of system designs. Subsequently, there are rising concerns and confrontations on website design, implementation and assessment techniques.

Further, it is analyzed that one of the domains where websites are widely used nowadays is the academic domain for the purpose of information distribution, e-learning, etc. Evaluating the quality of a website helps to estimate whether the website is attaining its intended purpose for learners. Besides, the assessment results can help to predict the parts of the website that needs improvement.

While discussing about the quality assessment criteria, a set of quality parameters is required that defines what is expected from the site characteristics. The set of website characteristics and the relationship among them is considered as the base for forming a quality assessment model. Moreover, to evaluate the quality of websites, it is necessary to analyze which quality parameters to take into account, which kind of evaluation procedure to utilize and which viewpoints of users are to be considered for the evaluation purpose [1].

A website quality model 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 [2].

1.1 Problem of Research:

A university website is an important to its users since it delivers to them information and services such as courses and programs, delivering online learning facilities and online registrations. Many studies in quality evaluation for education website have some limitations in:

- They apply their model on specific factors [3].
- They focus on student and forget other users [4].

Recently, many of latest studies try to overcome these limitations. This study introduces an evaluation assessment model for academic websites.

1.2 Objectives:

The main objective of this research is to investigate the relative importance of specific quality criteria in the evaluation of the quality assurance of educational websites from different viewpoints of users.

The specific objectives for the research are:

- To develop model to determine evaluation criteria for assessing the quality of educational websites.
- Used data to verify the model.
- To conduct a survey judges the relative importance (weights) of the different categories of the developed quality criteria.
- To determine if users majors/specializations have an impact on the relative importance of the developed quality specify factor.

1.3 Methodology:

This thesis used the following approaches:

1. Build the proposed model.
2. Design a questionnaire for quality requirement.
3. Verify the proposed model.
4. Apply the proposed model on education website.
5. Evaluate the result.

1.4 Hypotheses:

The hypotheses of research are the following:

- Due to continuous improvements in university websites it is necessary to have model to show the basic principles for how to build educational websites with high quality or how to evaluate it.
- The model provides specific quality criteria for the evaluation the quality of educational websites from different viewpoints of users.
- The university allows to student to do operations like registration, receive notifications (time table, exam date, result description). The model describes the main factors to do this operation in high quality.
- Help developer to build website with high quality and minimize the duration time to select the main criteria.

1.5 Thesis Organization:

Chapter one gives introduction about the project, defining the problem, objectives, methodology and hypothesis Chapter two contains two parts. Part one represents a general background about Educational website quality Evaluation. Part two is the related studies and techniques that used. In Chapter three which contains the project methodology. Classify by two parts, part one selects the web quality factors and criteria the build the model. Part two is design the questionnaire for quality requirement and Chapter four is contains the main part. I will apply the proposed model on the case study finally Chapter five is the results and recommendations.

Chapter 2

Literature Review& Related Works

2.1 Introduction

This section presents several quality models as the foundation for proposing an appropriate model for Educational website. There are numerous works found in literature focusing on Educational websites evaluation.

2.2 website quality and quality models

"Quality is the function of a product that changes the world for the better."Dr. Tom DeMarco [3].

Definition of website quality is how well a website is designed and how well the design meets 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 programmer's view point on the degree of Maintainability, Security, Functionality, etc. Whilst the end-users are paying more attentions to Usability, Efficiency, Creditability, etc. [3].

A quality model is defined as 'the set of characteristics and the relationship between them, which provide the basis for specifying quality requirements and evaluating product quality' [2].

2.3 Existing Software and Website quality Models

2.3.1 Boehm Model

Boehm introduced a model for evaluating the quality of software both automatically and quantitatively. It presents a hierarchical structure similar to McCall consisting of High-Level, Intermediate-Level and Low-Level Characteristics as showing in figure 2.1. Each of these characteristics contributes to the total quality of software product. This model takes into account some

considerations of software product with respect to the utility of the program. Boehm also extended characteristics to the McCall model by emphasizing the Maintainability factor of a software product, which is one of the advantages of this model [2].

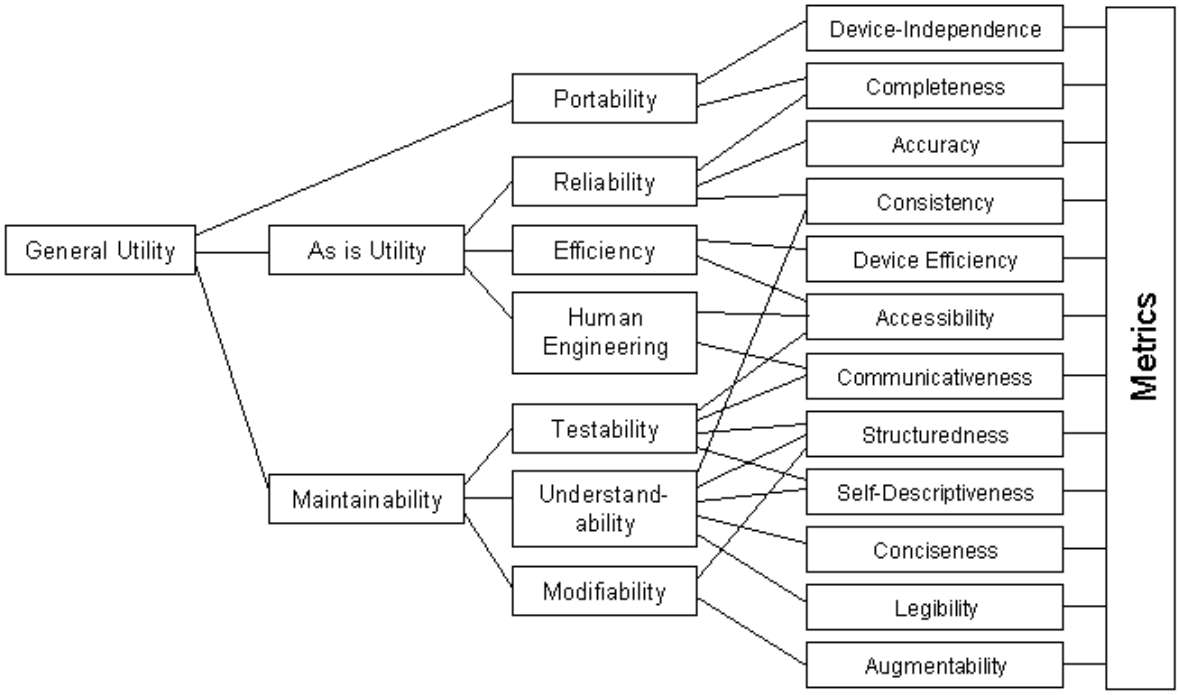

Figure 2.1: Boehm Model

2.3.2 FURPS Model

Robert Grady and Hewlett Packard proposed the FURPS model that decomposes characteristics into two categories of requirement: Functional Requirements and Non-Functional Requirements [4]. Functional requirements (F) are defined by input and expected output while non-functional requirements (URPS) consist of usability, reliability, performance and supportability.

2.3.3 Dromey Model

Dromey proposed a working framework for evaluating requirement determination, design and implementation phases. The framework consists of three models namely Requirement Quality Model, Design Quality Model and Implementation Quality Model. Layers are defined as high-level attributes and subordinate attributes. The main idea of this model is to create a framework that is broad enough for different systems; and to understand the relationship(s) between characteristics and sub-characteristics of quality product [5] as showing in figure 2.2. As such, different evaluation is proposed for each product.

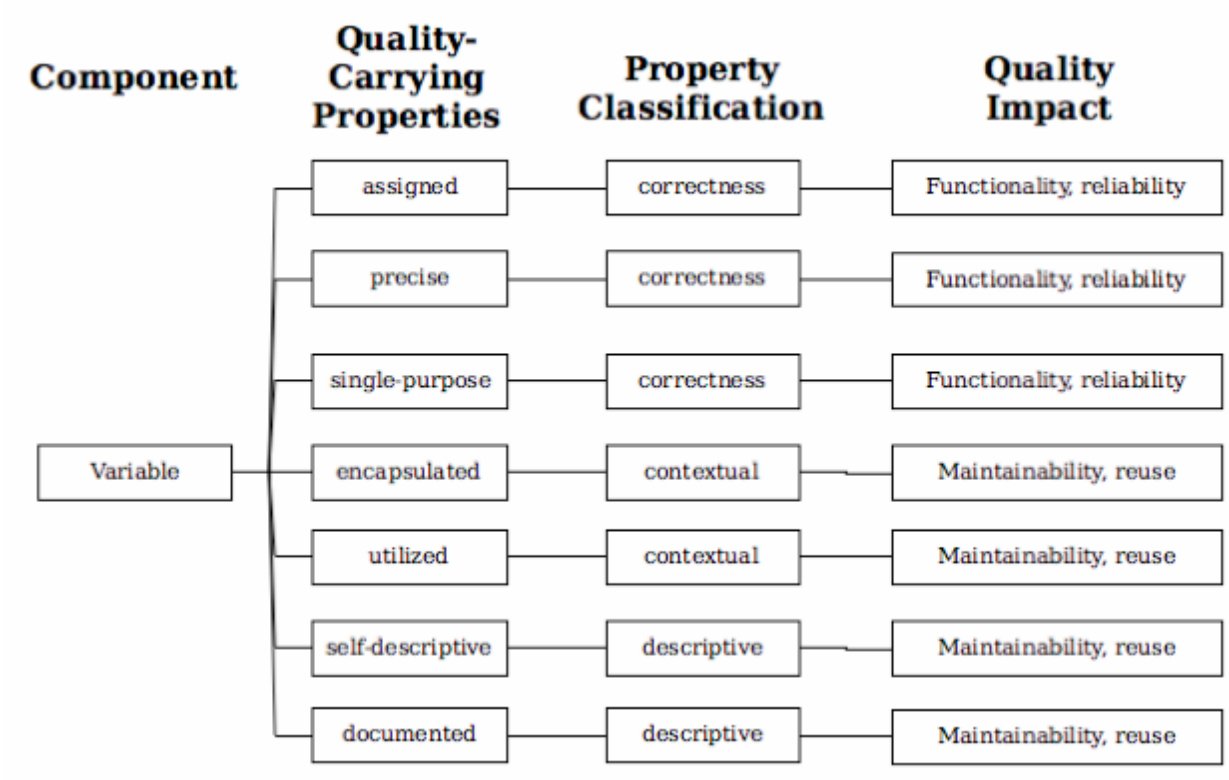

Figure 2.2: Dromey Model

2.3.4 Bayesian Belief Network Model

The Bayesian Belief Network (BBN) model is represented in hierarchical structure, similar to McCall and Boehm. The structure is graphically illustrated, where nodes represent Variables and arrows represent the Relationships between nodes. The root of the tree represents the node quality and is connected to quality characteristics nodes. Each quality characteristics node is further connected to corresponding quality sub-characteristics. The advantage of this model is that it can represent and manipulate complex models that could not be implemented using conventional methods [5].

2.3.5 ISO 9126-1 Quality Standard

The International Standardization Organization (ISO) set this model initially in 1991 and it was later refined in the past 10 years by ISO Software Engineering experts. It follows from the McCall's and Boehm's model, incorporating the features of both models. It prescribes six quality characteristics (quality requirements): Functionality, Usability, Maintainability, Reliability, Portability and Efficiency to evaluate software quality. The quality definition given in this standard is "The totality of features and characteristics of a software product that bears on its ability to satisfy stated or implied needs" [10].

The ISO 9126-1 series of standards (ISO 9126, 2001-2003) address software quality from the product perspective through its four parts. Part I of the model was revised to specify a quality framework that distinguishes three different approaches to software quality: internal quality, external quality and quality in use. The three approaches in this model can be summarized as follows:

2.3.5.1 Internal Quality

It is defined as "the totality of attributes of a product that determine its ability to satisfy stated and implied needs when used under specified conditions" [10]. It

can be measured and evaluated by a set of documents, like specification of requirements, architecture, design or piece of software code. This includes characteristics like testability, flexibility and fault tolerance.

2.3.5.2 External Quality

It is defined as “the extent to which a product satisfies stated and implied needs when used under specified conditions” [10]. It is the quality of the product from the external view. It can be measured and evaluated by dynamic properties of the product by running the application or simulating the execution of the application in a seemingly actual environment. This is the result of the combined behavior of the software application and the computer system. This includes characteristics like performance, reliability, usability, accuracy and integrity.

2.3.5.3 Quality in use

It is defined as “the extent to which a product used by specified users meet their needs to achieve specified goals with effectiveness, productivity and satisfaction in specified context of use” [10]. It can be measured and evaluated by the extent to which the software meets specific user needs in the actual context of use. Quality in use indicates the effectiveness, productivity, safety, and satisfaction of users in using the software in the actual context of usage rather than measuring the quality of the software [11].The three quality approaches in the ISO 9126-1 model refer to software operating under specific conditions and context of use. This illustrates that software quality is not an absolute concept; rather it is dependent on the situation and context of use. Moreover, all the three approaches are interrelated.

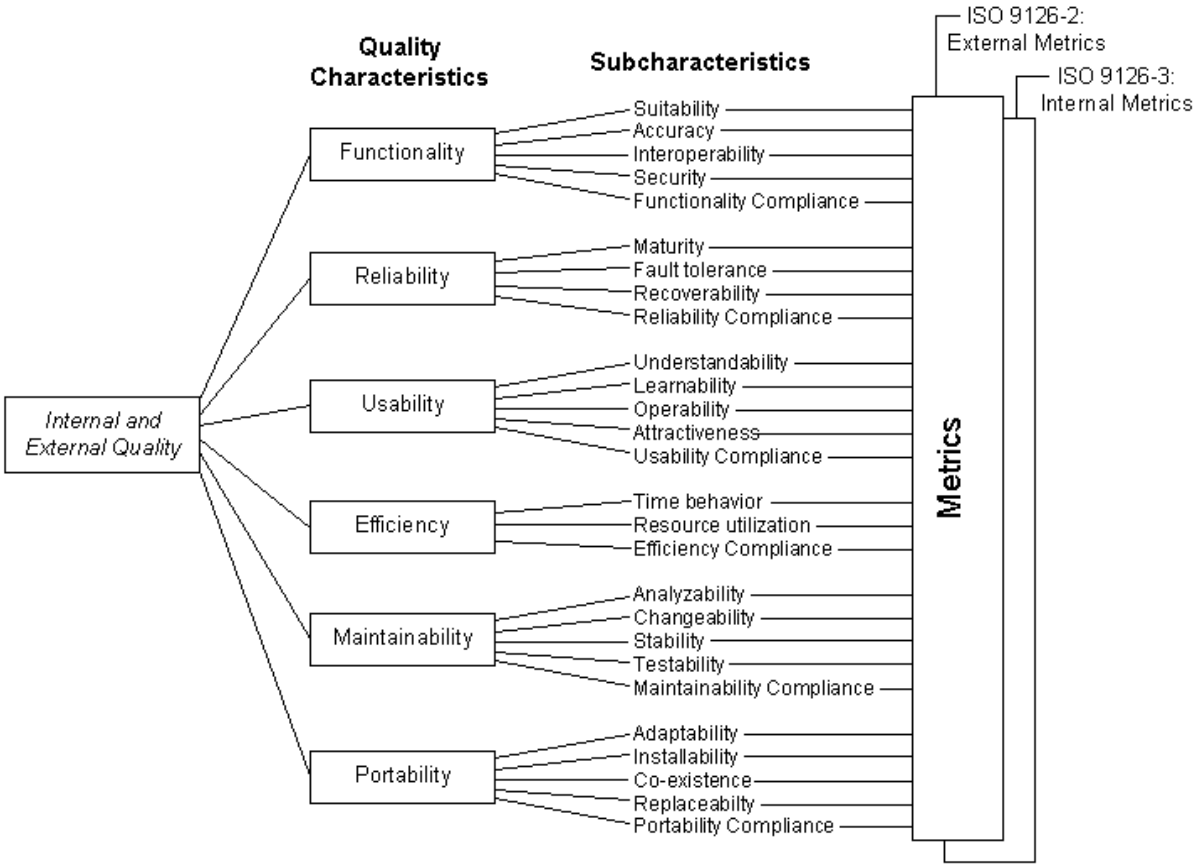

Figure 2.3: ISO 9126-1 Quality Standard

The external and internal quality characteristics are shown with the three layers in Figure 2.4 below. As can be seen from the lists of the quality characteristics, the model shares similar quality characteristics from McCall and Boehm's models. Even though it consists of characteristics, sub characteristics and quality measures; the quality characteristic list is not complete and fixed. So that according to the type of the software under evaluation and the reasons behind the evaluation, necessary characteristics, which are not mentioned in the model, can be introduced. The ISO model therefore acts as a starting point for conducting software evaluation; it can be adopted to include essential quality characteristic of the software product under consideration, so to speak.

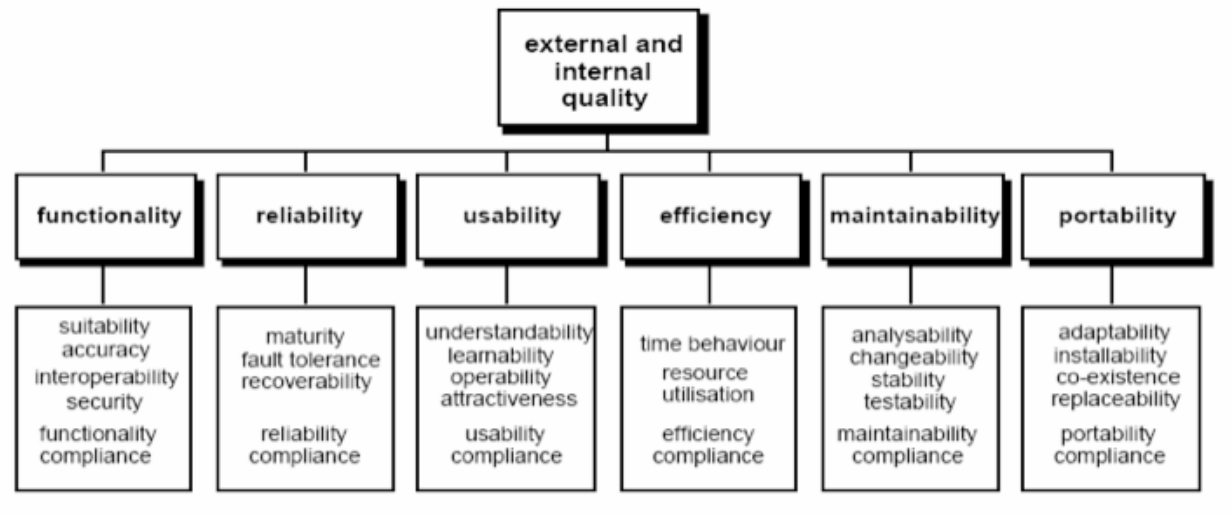

Figure 2.4: ISO 9126-1 model external and internal quality approaches

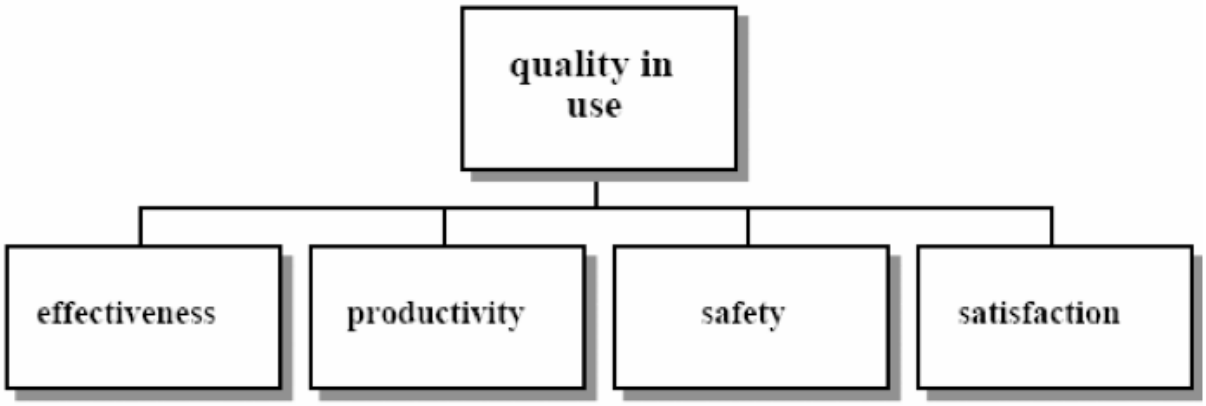

Figure 2.5: ISO 9126-1 Quality in use model [11]

2.3.6 McCall Model

McCall defines the quality of a software product through 3 different perspectives namely Product Operations, Product Revisions and Product Transitions [7]. It consists of 11 quality factors to describe the external view of the software (users' view); 23 quality criteria to describe the internal view of the software (developer's view); and a set of metrics that are used for quality evaluation. The fundamental idea of this model is assessing the relationship among external quality factors and product quality criteria. A major contribution

of this model is the relationship between quality characteristics and metrics. However, there are criticisms such as not all metrics are objectives [2] and the functionality of software product is not considered in model [8].

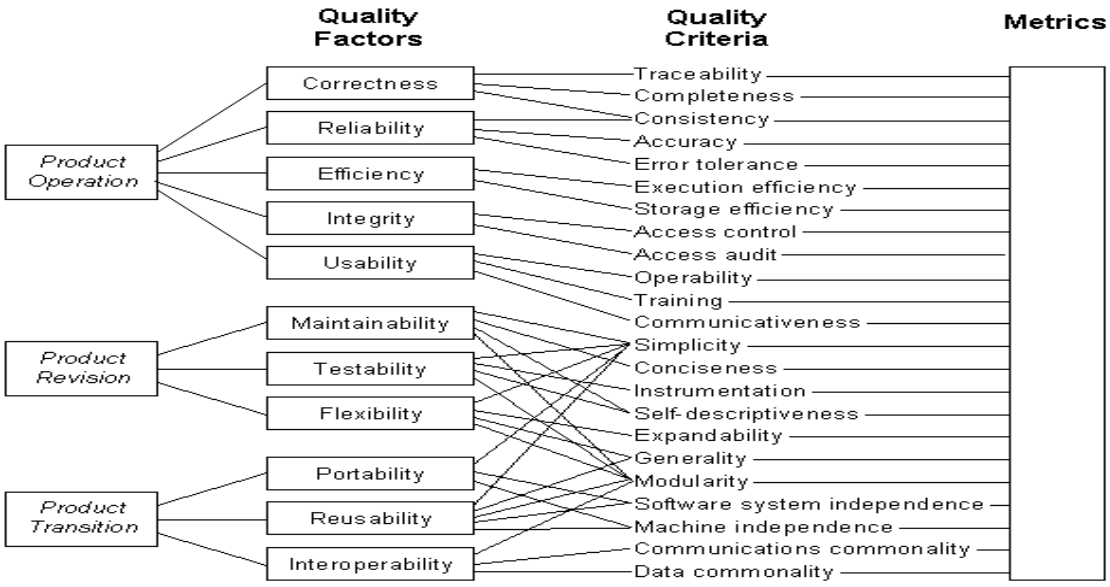

Figure 2.6: McCall Model [8]

Table 2.2: Comparison of Software Quality Models (Factors) [9]

Criteria /goals (in ascending order)	McCall Model	Boehm Model	Dromey Model	FURPS Model	ISO 9126-1 Model
Clarity		✓			
Correctness	✓	✓			
Documentation		✓			
Economy		✓			
Efficiency	✓	✓	✓		✓
Flexibility	✓	✓			
Functionality			✓	✓	✓
Generality		✓			
Integrity	✓	✓			
Interoperability	✓				
Maintainability	✓	✓	✓		✓
Modifiability		✓			
Performance				✓	
Portability	✓	✓	✓		✓
Reliability	✓	✓	✓	✓	✓
Resilience		✓			
Reusability	✓	✓	✓		
Supportability				✓	
Testability	✓				
Understandability		✓			
Usability	✓	✓	✓	✓	✓
Validity		✓			
Total = 22	**11**	**17**	**7**	**5**	**6**

2.4 Related Works:

2.4.1Website Quality Assessment Model (WQAM) for Developing Efficient E-Learning Framework- A Novel Approach [11]

They develop a comprehensive and measurable framework for evaluating an e-learning website.

They adopt a multi phase approach to develop an efficient e-learning framework. They include abroad range of literature survey of leading site, success factor identification from research literature and they also use their knowledge in the field. After they found the comprehensive review of distinctive evaluation methods and their element which are involved in different service over the internet they proposed the website quality assessment model. The high level quality parameters of their model are: **accuracy, feasibility, utility and propriety.**

After that they build Questionnaire Sample (QS), the sample is completely based on the four high level quality metric stated above. then they assessed they quality of existing e-learning website, then they moved to evaluation faces and its content two stage of calculation, in first stage they calculate the overall quality range evaluation on metrics. The second stage of evaluation is for topic wise examination to examine the content of website for each topic given.

Finally the website quality assessment model gives the newly developed website wide range of suggestion to help the developer to build website concurrence to quality metrics.

2.4.2 Website Quality Assessment Criteria [15]

In this paper they used Analytic Hierarchy Process (AHP) to elect criterion and sub-criterion weights to access user performance with respect the selected website. They select 133 students to do the assessment after that they eliminate 11 students because of the low of consistency in rating in Analytic Hierarchy Process (AHP).

After that they collect the assessment result then analysis the result. The work resulted in the formulation of a quality assessment model, which is based on nine composite criteria. These criteria focus more on the semantics that underlie website use and address to a lesser degree the software engineering characteristics of the site.

2.4.3 Evaluation of Academic Website Using ISO/IEC 9126 [16]

In this paper they collect data using questionnaire given to all students at Telkom University. The questionnaire is made by serving the positive and negative questions for all criteria. They involve 210 students selected randomly from all faculties and majors at Telkom University. After that they select three characteristics which are: functionality reliability and usability. Then they used Kano evaluation method to analyst the questionnaire result. In Kano evaluation method they classified the three characteristics in groups then passed them to the test.

Each criterion is grouped according to evolution table in attractive group. After they analysis the result they found the priorities of criteria's at the following order. The reliability come first then usability and functionality.

2.5 Discussion

Most literature review focused on student to do the evaluation of educational website and most model that designed with specific factors they did not have base model to select the factor from them.

In this thesis I will select ISO 9126-1 as base model for my research because it is used in most of studies and was selected factor from it depends on the field, and collected another factor from different model because to be more powerful, then hyper it in one model then apply it on the case study by using different users.

Chapter 3

Methodology

3.1 Introduction:

This chapter discusses about how the propose education website quality model is build

Usually to evaluate any task need some elements (factors) or existing quality standard model that tells witch factor is accurate and effective.

3.2 Uses of academic websites

After study the existing software's and education website quality models, the ISO 9126-1 is preferred to be the based model for build the evaluation model. Some of the website model was designed based on the ISO model quality characteristics. In the proposed model characteristics and sub-characteristics based onISO9126-1 quality evaluation model. build the quality evaluation model different group of users are identified, every group has different requirement from website.

3.2.1 The main users of education website are:

- Student.
- Teacher.
- Visitors.

3.3 Quality characteristics of the ISO 9126-1 quality model

In this step was selected, classified and grouped the criteria, sub-criteria to a website evaluation model. Then it is further broken down through a quantitative evaluation. The high-level quality characteristic and sub-characteristics factor of ISO 9126-1that was taken it in proposed model are in the table 3.1:

Table 3.1: ISO 9126-1 factors

Characteristics	Sub characteristics	Definitions
Functionality	Accurateness	This refers to the correctness of the functions;
Reliability	Fault tolerance	The ability of software to withstand (and recover) from component, or environmental, failure.
	Recoverability	Ability to bring back a failed system to full operation, including data and network connections.
Usability	Understandability	Determines the ease of which the systems functions can be understood, relates to user mental models in Human Computer Interaction methods.
	Learnability	Learning effort for different users, i.e. novice, expert, casual etc.
	Operability	Ability of the software to be easily operated by a given user in a given environment.
Efficiency	Time behavior	Characterizes response times for a given thru put, i.e. transaction rate.
	Accessibility	The website should be technically capable of supporting people with different disabilities access the website. It also should avoid use of plug-ins and proprietary extensions.

The quality factors that are not totally included in ISO 9126-1 model but that are present in the website model are content, navigation and design and structure of website. All of them content a sub quality factor and they are written in below:

3.4 Website Quality Assessment Criteria: [15]

Table 3.2: Web quality assessment criteria

Characteristics	Sub characteristics	Definitions
Content	Utility of content	Captures the degree to which website incorporates essential, useful, trustful and up to date information: "… all pages should state the date on which the page was last updated…"
	Completeness of information	Captures website's explanatory profile with respect to the information contained within the site: "…information should be presented in a directly usable format that does not require decoding, interpretation, or calculation…"
	Subject specialization	Captures the degree to which website offers specific information to those that need it.
	Reliability of content	Captures user's perception with respect to correctness and trustworthiness of information conveyed by the site.
Navigation	Convenience of navigation tools	Captures easiness in surfing around the site. For instance, labels should be placed in proximity to their related data fields, or, users should always be given the chance to return to "home page"
	Identity of site	Reflects uniqueness of the site and the characteristics that make the site unique in a world full of sites.
	Means of navigation	Reflects the availability of tools that support navigation in and around the site, such as labels, buttons, etc.
	Search engines	Captures both availability and readiness of search engines embodied in the site.
Design and structure	Order of elements	Reflects information presentation consistency.
	Loading speed	Reflects website's loading speed. Loading speed may vary according to software platform and network speed.

	Site map	Reflects quality (or even availability) of site map.
	Browser compatibility	Reflects to the ability to access and to use the site using a variety of different browsers. Websites should be designed for browsers at least one version lower than the most current version
	Real time information	Reflects website's responsiveness in providing information in real time conditions.

3.5 The Proposed Model:

Build of proposed model is done by selecting the factors from others models. The proposed model content two parts the first one came from the base model and it is ISO 9126-1 then selected some of factors from it. The second part came from website quality assessment criteria and also select part of them dependence on the requirements of education website. After that merge two parts in one model and this model consider the proposed model.

Table 3.3: proposed model

High level quality factors	Quality sub factors
Reliability	Fault tolerance
	Recoverability
Usability	Understandability
	Learnability
	Operability
Efficiency	Time behavior
	Accessibility
Content	Utility of content
	Completeness of information
	Subject specialization
	Reliability of content
Navigation	Convenience of navigation tools
	Identity of site
	Means of navigation
Design and structure	Order of elements
	Loading speed
	Site map
	Browser compatibility
	Real time information

Criteria

3.6 Sub quality factors of proposed model:

The high level quality factors of the proposed model are divided into number of sub characteristics. Characteristics are explained below:

3.6.1 Reliability:

According to the ISO 9126-1 model, reliability is defined as “A set of attributes that relate to the capability of software to maintain its level of performance under stated conditions for a stated period of time”

3.6.1.1 Fault tolerance

A link should always take users to valid page and there should not be dangling links and invalid links or orphan pages.

3.6.1.2 Recoverability

The website should take less time to recover back to it is last fine stage after problem has occurred.

3.6.2 Usability:

Usability in the ISO model is defined as “the ease of use for a given function”

3.6.2.1 Understandability

- To help users understand the structure of the website easily and make use of the website, the overall organization of the website should be presented in different methods.
- Label terms used must be simple to understand for users
- Terminologies used in help documentation should be related to user’s terminologies.

3.6.2.2 Learnability

Learning how to use the website should be easy for users.

3.6.2.3 Operability

Operating the website should not be a nightmare for users. The website should be easy to handle that would make uses feel in control while using it.

3.6.3 Efficiency:

The ISO 9126-1 model defines Efficiency as “a set of attributes that convey to the relationship between the level of performance of the software and the amount of resources used, under stated conditions”

3.6.3.1 Time behavior

Time delay for finding the website and displaying its pages must be 3-15 seconds (reasonable).

3.6.3.2 Accessibility

- Information should be accessible in text only version of the website.
- The website should support mobile and hand held devices.
- The website should support different browser platforms.

3.6.4 Content:

This characteristic is not part of the base model, but it is part of the website quality models studied and it is frequently mentioned in previous related studies of evaluating academic websites. Content is the information provided on a website.

3.6.4.1 Utility of content

All pages should state the date on which the page was last updated.

3.6.4.2 Completeness of information

Information should be presented in a directly usable format that does not require decoding, interpretation, or calculation

3.6.4.3 Subject specialization

Offer information to any users needs it.

3.6.4.4 Reliability of content

Website provides important and correct information to users.

3.6.5 Navigation:

A good navigation structure helps users to browse through the website in finding the information they look for without getting lost or being frustrated.

3.6.5.1 Convenience of navigation tools

I it is easy to go to homepage from another pages in website.

3.6.5.2 Identity of site

The name of university and logo are available in the navigation.

3.6.5.3 Means of navigation

Every link in navigation leads to same page with the correct information that relevance to name of links.

3.6.6 Design and structure:

3.6.6.1 Order of elements

Organization of information in the website is easy to understand and Easy to learn how to use the website and easy to find the information from users.

3.6.6.2 Loading speed

The website content more less media and that lead to fast in reload the page.

3.6.6.3 Site map

The website provide to user the location in which page and easy to navigate all pages without lost.

3.6.6.4 Browser compatibility

The website is compatible with browsers when open it with any browser.

3.6.6.5 Real time information

The website provide to users updated information and realistic information.

3.7 Testing of the new Model:

The analysis of quality evaluation of website in related work has made to understand website quality characteristics and quality model. This has helped to design the educational website quality evaluation model.

The following methods are proposed to evaluate the new quality evaluation model:

- Appling the proposed evaluation model for evaluating website as case study using questionnaire.
- Collect the questionnaire result and analyze it using MATLAB and Microsoft excel to design graphs.

3.7.1 Applying the Proposed Model in education website:

To evaluate the quality of education website the proposed model was building, educational website is built to communicate between student and staff and other users in general. Then the proposed quality evaluation model focus on student and staff and other users.

3.7.2 Preparation of Questionnaire:

A questionnaire is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. Questionnaires can be thought of as a kind of written interview. They can be carried out face to face, by telephone, computer or post.

Questionnaires provide a relatively cheap, quick and efficient way of obtaining large amounts of information from a large sample of people. Data can be collected relatively quickly because the researcher would not need to be present when the questionnaires were completed. This is useful for large populations when interviews would be impractical. [17]

The questionnaire is based on the proposed model. It is a set of questions and these questions were developed using the factors in the model as shown in table 4.

3.7.3 The questionnaire consists of five sections:

The first section contains the question about the educational level of the person whether he is a student or a teaching assistant or lecturer or associate professor. Second section contains information on the quality of the information on the site and a set of questions related to the accuracy of the information provided on the site. Third section contains inquiries about efficiency and documentation for information and links. Section fourth contains questions about ease of use and a range of factors that affect ease of use. Section fifth contains questions about the positions of the site and the elements of navigation and factors that affect the injury site.

Finally, the overall evaluation of the site was questioned by users with the reason for the evaluation.

In the questionnaire, all responses were based on one approach to assist in the analysis process of the questionnaire results and they are:

- Strongly agree.
- Agree.
- Natural.
- Disagree.
- Strongly disagree.

3.8 Quality factors for proposed Model

Table 3.4 Quality factors in the new Model

High level quality factors	**Quality sub factors**
Reliability	Fault tolerance
	Recoverability
Usability	Understandability
	Learnability
	Operability
Efficiency	Time behavior
	Accessibility
Content	Utility of content
	Completeness of information
	Subject specialization
	Reliability of content
Navigation	Convenience of navigation tools
	Identity of site
	Means of navigation
Design and structure	Order of elements
	Loading speed
	Site map
	Browser compatibility
	real time information

The full questionnaire is presented in Appendix

Chapter 4

Results and Discussion

4.1 Introduction

In this chapter discussed the effect of the proposed model based on the results obtained from the questionnaire applied to the case study.

4.2 Validation of the Proposed Model

To verify the model factors there are important factor call quality, need to use this factor value with the other quality factor values and compare between them. The quality factor result is excellent or very good or good or bad or poor.

The questionnaire apply on three tasks in the website depends on type of task easy or medium or hard.

The correlation result will be between 1 and -1 when the correlation between 1 and 0 that means the correlation is strong and if the correlation between 0 and -1 that means the correlation is week.

4.2.1 Result of easy task:

Table 4.1 below display the correlation between high quality factor and the important factor call quality for the any easy task in web site:

Table 4.1 correlation for easy task

No	High Quality factor	Correlation
1	Quality of information	0.95
2	Reliability	0.81
3	Efficiency	0.64
4	Usability	0.73
5	Navigation	0.62

4.2.2 Result of Medium task:

Table 4.1 below display the correlation between high quality factor and the important factor call quality for the any medium task in web site:

Table 4.3 correlation for medium task

No	High Quality factor	Correlation
1	Quality of information	0.31
2	Reliability	0.99
3	Efficiency	0.79
4	Usability	0.59
5	Navigation	0.40

4.2.3 Result of hard task:

Table 4.3 below display the correlation between high quality factor and the important factor call quality for the any hard task in web site:

Table 4.3 correlation for hard task

No	High Quality factor	Correlation
1	Quality of information	- 0.33
2	Reliability	0.51
3	Efficiency	0.68
4	Usability	- 0.27
5	Navigation	0.42

From the above result for the correlation can judge the model is reliable to evaluate any education website.

The questionnaire has been available since 9 7 2018 to 21 9 2018 in the site and was sent the link to the users first the students were sent the link through the publication in groups of students and professors and the doctor was published link to them in their personal accounts in social media. The questionnaire was sent to some who have handled the site from outside the university.

In the period in which the questionnaire was distributed to users, 124 questionnaires were filled out with 100 complete questionnaires filled out without shortages and 24 incomplete questionnaires.

The proposed model contains 7 high quality factors that were addressed in the questionnaire and were divided into 5 parts in part one is Quality of information in part two is efficiency part three Reliability, in part four is usability, in part five Navigation each part there is a set of questions describing sub-factors.

4.3 Result of the Questionnaire Data

In this section, the results of the questionnaire will be presented. The percentage of each part of the questionnaire was calculated separately according to the division mentioned in the previous paragraph. The factor that controls the calculation of the ratio is the academic level of the user. The following figure shows the number of users and is grouped according to the academic level:

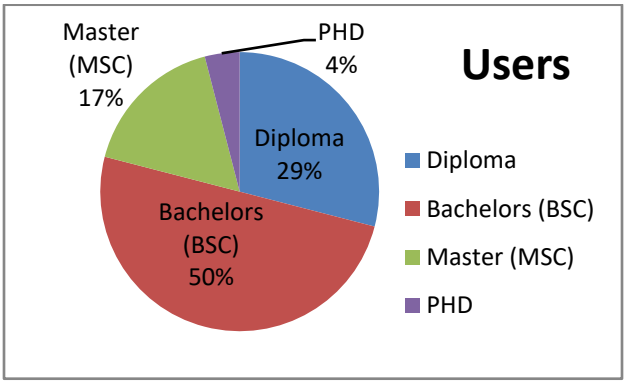

Figure 4.1: Users

It calculated the number of users and divides them into groups using MATLAB.

As I said earlier that the questionnaire was divided into four parts and the proportion of each part was calculated separately and I will explain how this percentage was calculated for each part.

Before that, the percentage was calculated based on the responses of the users. Is it a strong agree or agree or neutral or disagree or strong disagree and the total ratio of each part is 100% if there is a lack of filling out the questionnaire.

4.3.1 Quality of information:

The table below shows the number of users and their answers to the questions and the answers are collected based on the academic level of the user and the type of answer as mentioned in the previous paragraph for the quality of information and content.

Table 4.4: Quality of information

	Quality of information				
	Strong agree	Agree	Neutral	Disagree	Strong disagree
Diploma	155	72	40	19	2
Bachelors(BSC)	263	95	69	35	34
Master (MSC)	65	60	31	5	7
PHD	30	3	4	2	1

These results were extracted using MATLAB It has a high degree of accuracy and ease of programming and can handle a large number of data in a short time and perform complex calculations.

Then the percentage of each answer was calculated separately for all users at different levels of education and the equation below shows how this percentage was calculated:

Total of answers is: number of questions * number of users

Total of answers is: 8 * 124 = 992

Strong Agree percentage = $\sum i \ / totalOfAnswers$

i represent to columns data.

The table below shows the ratios in detail:

Table 4.5: Quality of information ratios in details

Strong Agree	Agree	Natural	Disagree	Strong Disagree	Total
51.71%	23.19%	14.52%	6.15%	4.44%	100.00%

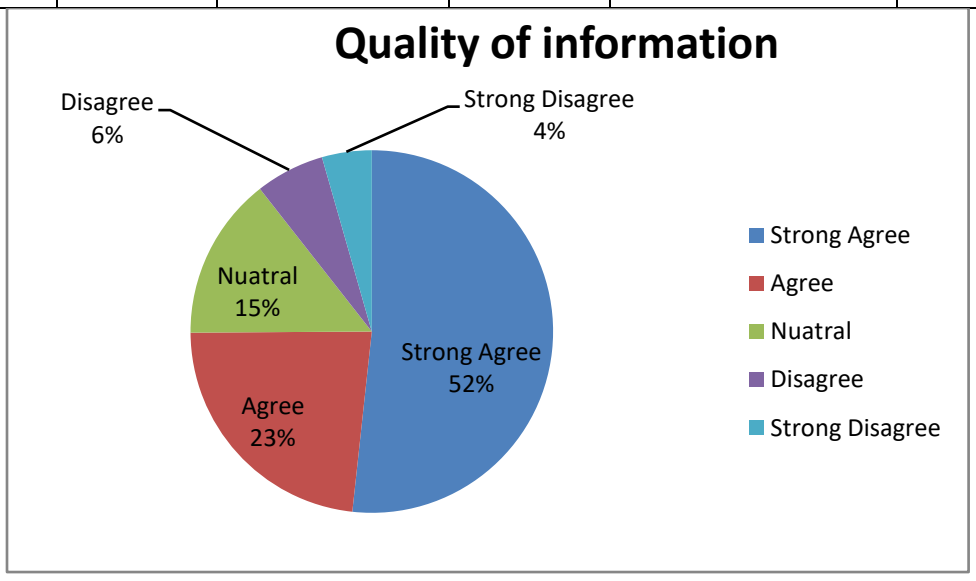

Figure 4.2: Quality of information

When designing sites, we find that the focus is on presenting the most important topics of the designated area so we find that the clarity of information and importance to the user is very high, unlike the interest in the announcement of the upcoming events there is always a delay in advertising but it is not fully supported for users specially in Sudan, addition to that there is no reference in some of the events reported on them these reasons lead to a lack of quality of information in the site.

4.3.2 Efficiency:

The table below shows the number of users and their answers to the questions and the answers are collected based on the academic level of the user and the type of answer as mentioned in the previous paragraph for the Efficiency and reliability.

Table 4.6: Efficiency ratios in details

	Efficiency				
	Strong agree	Agree	Neutral	Disagree	Strong disagree
Diploma	34	22	11.5	6	4
Bachelors(BSC)	79.5	28	25.5	7	5
Master (MSC)	25	16	5.5	2.5	1
PHD	5	0	0.5	1.5	3

Then the percentage of each answer was calculated separately for all users at different levels of education and the equation below shows how this percentage was calculated:

Total of answers is: number of questions * number of users

Total of answers is: 3 * 124 = 372

Strong Agree percentage = $\sum i \ / totalOfAnswers$

i represent to columns data.

The table below shows the ratios in details:

Table 4.7: Efficiency ratios in details

Strong Agree	Agree	Natural	Disagree	Strong Disagree	Total
38.58%	17.74%	11.56%	4.57%	3.49%	75.94%

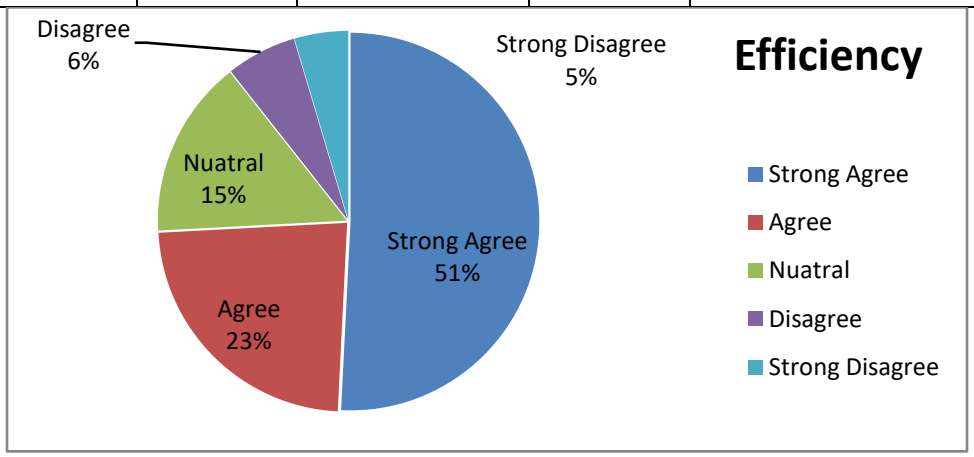

Figure 4.3: Efficiency

To ensure the efficiency of the work of the site must be easy access to the site at any time in a short time other than the ease of navigation between the pages of the site and the most important is when the error occurs in the site is working perfectly again all these factors available on the site and a very high rate There are some factors that affect the efficiency and reliability of the site, including that there are pages under construction are linked to the site and the formation of links and links also lead to the wrong pages These factors exist on the site but a small percentage.

4.3.4 Reliability

The table below shows the number of users and their answers to the questions and the answers are collected based on the academic level of the user and the type of answer as mentioned in the previous paragraph for the reliability.

Table 4.8: Reliability

	Reliability				
	Strong agree	Agree	Neutral	Disagree	Strong disagree
Diploma	34	22	11.5	6	4
Bachelors(BSC)	79.5	28	25.5	7	5
Master (MSC)	25	16	5.5	2.5	1
PHD	5	0	0.5	1.5	3

Then the percentage of each answer was calculated separately for all users at different levels of education and the equation below shows how this percentage was calculated:

Total of answers is: number of questions * number of users

Total of answers is: 3 * 124 = 372

Strong Agree percentage = $\sum i \ / totalOfAnswers$

i represent to columns data.

The table below shows the ratios in details:

Table 4.9: Reliability ratios in details

Strong Agree	Agree	Natural	Disagree	Strong Disagree	Total
38.58%	17.74%	11.56%	4.57%	3.49%	75.94%

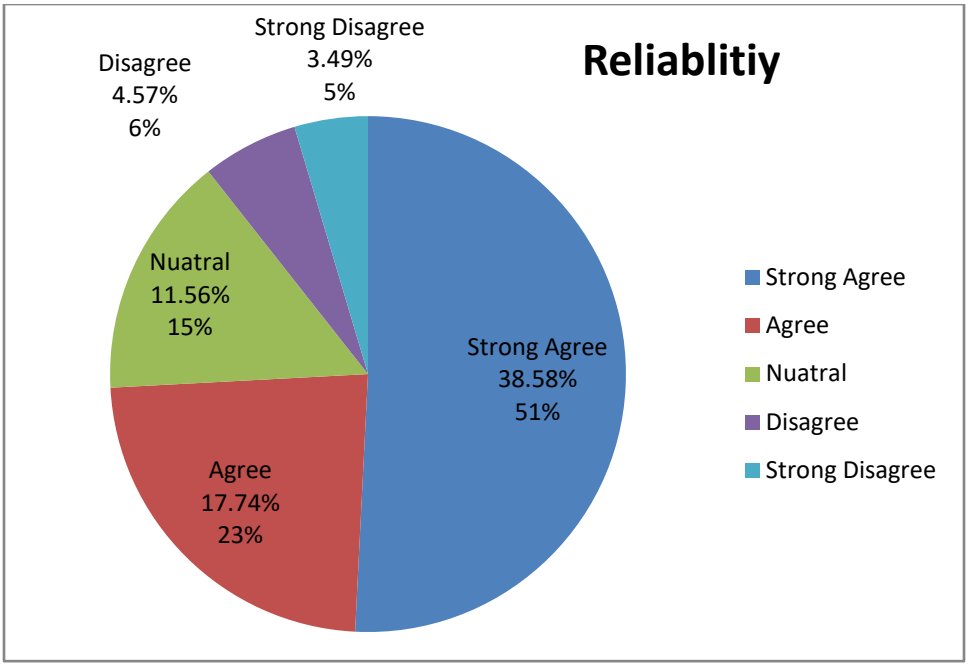

Figure 4.4: Reliability

To ensure the efficiency of the work of the site must be easy access to the site at any time in a short time other than the ease of navigation between the pages of the site and the most important is when the error occurs in the site is working perfectly again all these factors available on the site and a very high rate There are some factors that affect the efficiency and reliability of the site, including that there are pages under construction are linked to the site and the formation of links and links also lead to the wrong pages These factors exist on the site but a small percentage.

4.3.3 Usability:

The table below shows the number of users and their answers to the questions and the answers are collected based on the academic level of the user and the type of answer as mentioned in the previous paragraph for the Usability.

Table 4.10: Usability

	Usability				
	Strong agree	Agree	Neutral	Disagree	Strong disagree
Diploma	65	45	24	10	1
Bachelors(BSC)	153	91	30	5	11
Master (MSC)	58	25	12	3	2
PHD	3	8	3	0	1

Then the percentage of each answer was calculated separately for all users at different levels of education and the equation below shows how this percentage was calculated:

Total of answers is: number of questions * number of users

Total of answers is: 5 * 124 = 620

Strong Agree percentage = $\sum i \ / totalOfAnswers$

i represent to columns data.

The table below shows the ratios in details:

Table 4.11: Usability ratios in details

Strong Agree	Agree	Natural	Disagree	Strong Disagree	Total
45.00%	27.26%	11.13%	2.90%	2.42%	88.71%

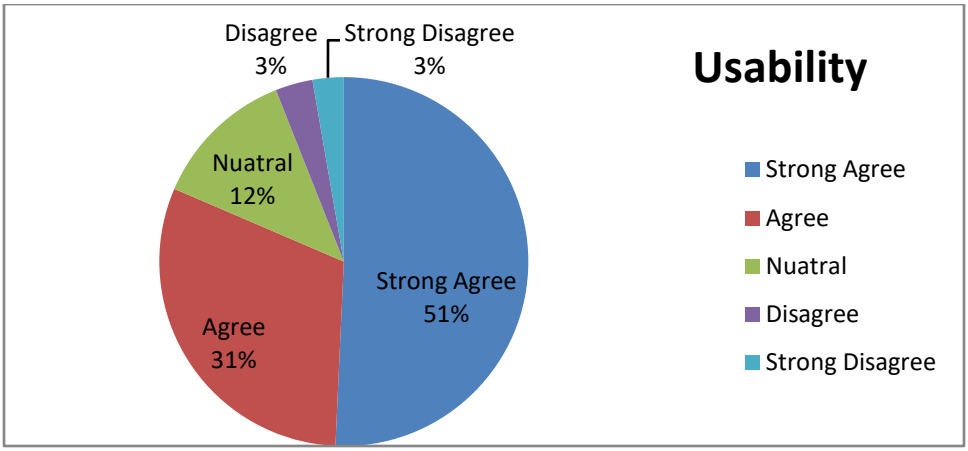

Figure 4.5: Usability

When designing sites with a clear structure and also use terms known to the user all this helps in the speed of learning and dealing with the sites on which these factors are available on the site at a very high, which increases the ease of use of the site.

4.3.4 Navigation:

The table below shows the number of users and their answers to the questions and the answers are collected based on the academic level of the user and the type of answer as mentioned in the previous paragraph for the Navigation.

Table 4.12: Navigation

	Navigation				
	Strong agree	Agree	Neutral	Disagree	Strong disagree
Diploma	65	45	24	10	1
Bachelors(BSC)	153	91	30	5	11
Master (MSC)	58	25	12	3	2
PHD	3	8	3	0	1

Then the percentage of each answer was calculated separately for all users at different levels of education and the equation below shows how this percentage was calculated:

Total of answers is: number of questions * number of users

Total of answers is: 6 * 124 = 744

Strong Agree percentage = $\sum i \ / totalOfAnswers$

i represent to columns data.

The table below shows the ratios in detail:

Table 4.13: Navigation ratios in detail

Strong Agree	Agree	Natural	Disagree	Strong Disagree	Total
31.80%	11.98%	8.29%	2.30%	3.23%	57.60%

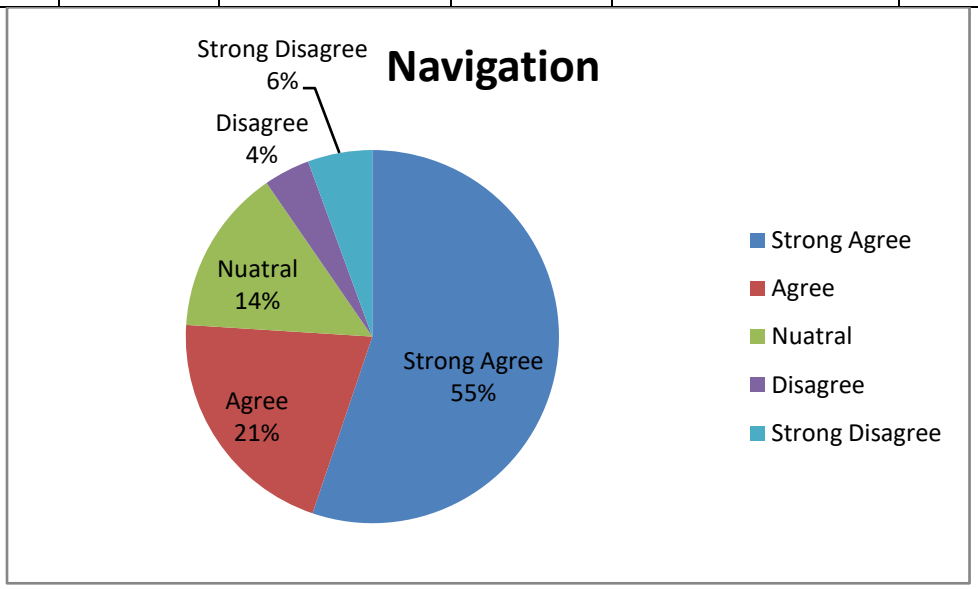

Figure 4.6: Navigation

In order to make sure that the site has its own functions, it is necessary to provide some factors, such as when conducting any operation, it is necessary to know the place in it in the site that helps in understanding the process to be performed

otherwise. Do not lose during the navigation between the pages to complete the process and the last possibility to return in case Loss All these factors are available on site but by an average.

4.3.5 The overall rating:

The table below represents the overall evaluation of the site by users as the percentage of each rating was calculated separately.

Table 4.14: The overall rating

Excellent	Good	Moderate	Poor	Bad	Missing
38.71%	29.03%	11.29%	0.00%	1.61%	19.35%

The figure below represents the overall rating of the site:

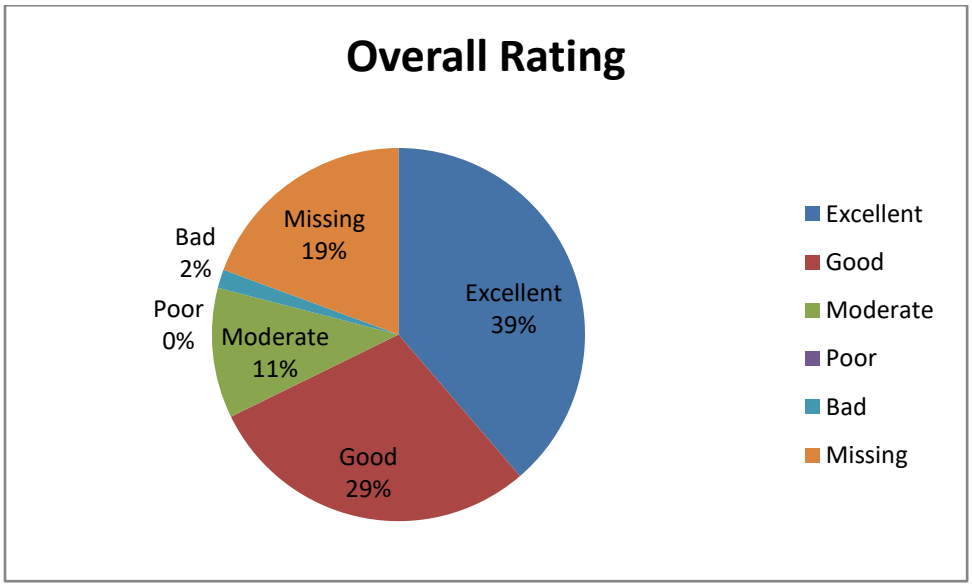

Figure 4.7: Overall rating

Chapter 5

Conclusions and recommendations

5.1 Conclusions:

The main objective of the research is to design a model for evaluating the quality of educational websites. To achieve this goal, previous studies and previously established models have been applied to sites to measure their quality.

Previous studies have shown that all the models that were created previously did not cover all the factors that affect the quality of the educational sites and it did not apply to all users as it focused on students only.

After studying the previous studies, I found that ISO 9126-1 is one of the most suitable models for evaluating educational sites and has been used in most studies concerning evaluation of educational sites. It also divides factors into high level factors and each factor contains partial factors and considered it as base model.

Then, during the research in previous studies found a study containing the factors that are specialized in the quality of all the sites I took the most important factors that can be said to be appropriate with educational sites.

Then you combine the selected factors of the two models to form a new model in which the model is divided in the same way as the base model into the main high level factors and partial factors.

The second objective of the research is to apply the new model to the case study, which is to apply the new model on the site of the University This evaluation was conducted through a questionnaire distributed to users of the site.

This questionnaire consists of a set of questions. These questions have to do with the factors of the proposed new product. The questionnaire was then divided into four parts.

The questionnaire was distributed to students through social networking groups as well as professors and visitors.

The results of the questionnaire were then analyzed by MATLAB and the percentage of each part of the questionnaire was calculated separately. Where the quality of the information comes first, as its percentage in the site reached 74.90% followed by ease of use by 72.26%, then the efficiency and reliability of 68.82%, and in the latter comes the functions and mobility, as it reached 61.18%.

After the results are extracted and analyzed, the third objective is the recommendations on the modifications that are supposed to occur to the site based on the selected factors in order to reach the site to a high degree of quality.

5.2 Recommendations

The weighting of each factor is influenced by quality and is explained by its importance because there are some important factors that must be present in any quality assessment model.

Measure the ratio of each of the factors of the model separately to determine where the quality is being improved

Cover more factors that affect the quality of instructional sites.

Before starting the design or development of sites, it is necessary to collect the needs of the users of the site accordingly build and develop sites of high quality.

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Appendix

- **Full Questionnaire**

Page 1

جامعة السودان للعلوم والتكنولوجيا

كلية الدراسات العليـــا

إستبانـــة

السلام عليكم ورحمة الله وبركاتة ،

وبعد:

بين يديكم استبانة لطالب دراسات عليا-جامعة السودان للعلوم والتكنولوجيا ، هذه الاستبانة الغرض منها جمع معلومات حقيقية ودقيقة لتقيم جوده الموقع الالكتروني لجامعة المشرق وذلك من خلال تعاونكم معنا.حيث تستهدف كل من(الطلاب الجامعين والاساتذه و الزوار للمواقع التعليمية)، لذا أرجو منكم شاكرا التفضل بملء الاستبانة علما بأن هذه المعلومات لأغراض البحث العلمي فقط.

Questionnaire to evaluate the quality of Mashriq University (MU) website

Academic level

Question	Diploma	Bachelors (BSC)	Master (MSC)	PHD
Choose The Academic Level إختيار المستوى التعليمي	◉	○	○	○

continue

Page 2

1 from 4 Please provide your opinion on the quality of information the website provides

1.1 Accuracy and Subject specialization

Question	Strong Agree	Agree	Neutral	Disagree	Strong Disagree
The information provided in website is clear المعلومات المقدمة في الموقع واضحة	◉	○	○	○	○
I think the websites provides important information to users أعتقد أن الموقع يوفر معلومات مهمة للمستخدمين	◉	○	○	○	○

1.2 Utility of content and real time information

Question	Strong Agree	Agree	Neutral	Disagree	Strong Disagree
It is obvious to find creation and update time of contents in the website من الواضح أن تجد وقت إنشاء وتحديث محتويات الموقع في الموقع	◉	○	○	○	○
It is easy to find information about upcoming event in the university من السهل العثور على معلومات حول الأحداث القادمة في الجامعة	◉	○	○	○	○
The website offer current and up to date information يقدم الموقع معلومات حديثة	◉	○	○	○	○

1.3 Completeness of information and Identity of site

Question	Strong Agree	Agree	Neutral	Disagree	Strong Disagree
Author name of pages are available اسم كاتب الصفحات متاح	◉	○	○	○	○
Link outside reference used in the website are given يتم اعطاء رابط يوضح مصدر المعلومه في الموقع	◉	○	○	○	○
The name of university ,logo and copyright information are available اسم الجامعة والشعار ومعلومات حقوق التأليف والنشر متاحة	◉	○	○	○	○

continue

Page 3

2 from 4 Please provide your opinion on the efficiency and reliability of the website

2.1 Reliability

Question		Strong Agree	Agree	Neutral	Disagree	Strong Disagree
Clicking on a link takes to valid page	النقر على رابط يأخذ إلى صفحة صالحة	◉	○	○	○	○
Whenever some error occurs, the website recover quick	كلما حدث خطأ ما ، يتعافى موقع الويب بسرعة	◉	○	○	○	○
Accessing the website at any time	الوصول إلى الموقع في أي وقت	◉	○	○	○	○

2.2 Efficiency and Browser compatibility

Question		Strong Agree	Agree	Neutral	Disagree	Strong Disagree
It is possible to find what I want within reasonable time	من الممكن العثور على ما أريد في غضون فترة زمنية معقولة	◉	○	○	○	○
It is possible to switch between pages within reasonable time	من الممكن التبديل بين الصفحات في وقت معقول	◉	○	○	○	○
Accessing the website from the favorite browser	الوصول إلى موقع الويب من المتصفح المفضل	◉	○	○	○	○

continue

Page 4

3 from 4 Please provide your opinion on the usability of the website

3.1 Understandability, learnability, operability, Order of elements and site map

Question		Strong Agree	Agree	Neutral	Disagree	Strong Disagree
I think the overall structure of website is straightforward	أعتقد أن الهيكل العام لموقع الويب واضح ومباشر	◉	○	○	○	○
Terminology used in website is understandable	المصطلحات المستخدمة في الموقع مفهومة	◉	○	○	○	○
I think it is easy to learn how to used website	أعتقد أنه من السهل تعلم كيفية استخدام الموقع	◉	○	○	○	○
It is easy to find the information I need on website	من السهل العثور على المعلومات التي أحتاجها على موقع الويب	◉	○	○	○	○
Organization of information in the website is easy to understand	تنظيم المعلومات في الموقع سهل الفهم	◉	○	○	○	○

continue

Page 5

4 from 4 Please provide your opinion on the Functionality, Navigation and loading speed

4.1 Navigation

Question		Strong Agree	Agree	Neutral	Disagree	Strong Disagree
It is easy to go to home page from any other page in website	من السهل الانتقال إلى الصفحة الرئيسية من صفحة أخرى في موقع الويب	◉	○	○	○	○
While navigation I can tell where I am in website	أثناء التنقل ، يمكنني معرفة مكانتي في موقع الويب	◉	○	○	○	○
I am able to move from one page to another page without getting lost	أنا قادر على الانتقال من صفحة إلى صفحة أخرى دون أن أضيع	◉	○	○	○	○
I can easily navigate backwards through previously visited pages	يمكنني التنقل بسهولة إلى الخلف عبر الصفحات التي تمت زيارتها مسبقًا	◉	○	○	○	○
Search hints are provides when wrong keyword are used	يتم توفير تلميحات البحث عند استخدام كلمة رئيسية خاطئة	◉	○	○	○	○
The website provides varied search options	يوفر الموقع خيارات بحث متنوعة	◉	○	○	○	○

Question		Excellent	Good	Moderate	Poor	Bad
The overall rating would you give to the quality of the Mashriq University (MU) website?	التقييم العام الذي ستقدمه لجودة موقع جامعة المشرق (MU)	◉	○	○	○	○
Why?	لمـــاذا					

Save