

1 Introduction:

With the increasing use of software systems in modern societies and people's reliance on it in daily life, many software systems emerged. E-commerce (Electronic commerce or EC) is one of the software systems and it is; the buying and selling of goods and services, or the transmitting of funds or data, over an electronic network, primarily the Internet (Rouse, 2016).

In Sudan, there are e-commerce systems, but people do not use it often, they use traditional ways of commerce more because of different reasons, and the concept of e-commerce is relatively new in the country.

Software is an essential part of E-commerce systems and it should meet people's expectations to gain customer satisfaction, to achieve that one must implement software quality engineering on e-commerce systems by defining the expected characteristics or properties of high-quality software (Tian, 2005).

2 Research problem:

Although good quality is a very important factor for software systems, the situation in Sudan made it hard for people to put it as a priority because they are not completely aware of its importance and mainly focus on costs they can afford, and that lead to e-commerce systems with bad quality or even with no quality standards at all sometimes, the results will always be unsatisfied customers.

3 Research objectives:

The aim of this research is to propose a quality model to implement quality standards on e-commerce systems in Sudan based on people likings and behaviors toward using such systems, what will make people's experience when using e-commerce systems more enjoyable and satisfactory.

In order to achieve the aim above researcher will discuss the types of e-commerce systems in Sudan, then going to analyze collected data to find out what people prefer, and get the idea of a most fitted model to implement quality.

4 Research importance:

The researcher will provide an overview about the types of e-commerce systems that are most used in Sudan.

Then propose a model that will help developing E-commerce systems with high quality via a systematic way, by implementing the model that she is going to build based on results of the questionnaire she had issued to collect data to use in research.

5 Research hypothesis:

The researcher is going to prove and test the following hypotheses:

1. People use E-commerce systems in Sudan. What E-commerce systems do they use and how?
2. There are obstacles that make it hard for people to use E-commerce systems in Sudan. What obstacles?
3. There are ways to encourage people to use E-commerce systems in Sudan. What are these ways?
4. There are ways to help spread the concept of quality in Sudan among E-commerce systems? How?

6 Research scope:

People from Sudanese community are the main scope of this research; they are users of e-commerce systems. Software quality engineering (on e-commerce software) is what the researcher will implement on this scope, by considering questionnaire results and considering different types of quality models to propose a quality model to apply on e-commerce systems.

7 Research methodology:

The research methodology that the researcher used is qualitative; it involves describing in details specific situation using research tools like questionnaire and Observations, qualitative Research is primarily exploratory research (Wyse, 2011).

The researcher used: questionnaire to find the E-commerce systems that are most used in Sudan, and observation to get the factors from questionnaire-collected data, with the consideration of other quality models factors.

8 Research structure:

This research will contain six chapters, including this chapter, divided as the following:

Chapter 1: introduction.

Introduction: about the research problem, objectives, importance, hypothesis, scope, methodologies and structure.

Chapter 2: literature review.

Literature review: about e-commerce and quality engineering, their types, and specifications, and previous studies in the same area of the research.

Chapter 3: Methodology.

Methodology that the researcher used in results.

Chapter 4: Results and analysis.

Questionnaire results and the analysis of results collected by the questionnaire about the use of e-commerce systems in Sudan.

Chapter 5: proposed quality model.

The proposed quality model's factors.

Chapter 6: conclusion and recommendations.

The conclusion and recommendations for further studies in the research.

1 Introduction:

This chapter is literature review about the research subject; it contains the general definitions about quality and e-commerce systems, and previous studies in subject of research.

2 E-commerce systems:

Electronic commerce, commonly written as e-commerce, is the trading or facilitation of trading in products or services using computer networks, such as the Internet.

Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail.

2.1 Types of E-commerce systems:

2.1.1 Business-to-Consumer (B2C):

In a Business-to-Consumer E-commerce environment, companies sell their online goods to consumers who are the end users of their products or services.

2.1.2 Business-to-Business (B2B):

In a Business-to-Business E-commerce environment, companies sell their online goods to other companies without being engaged in sales to consumers.

2.1.3 Consumer-to-Business (C2B):

In a Consumer-to-Business E-commerce environment, consumers usually post their products or services online on which companies can post their bids. A consumer reviews the bids and selects the company that meets his price expectations.

2.1.4 Consumer-to-Consumer (C2C):

In a Consumer-to-Consumer E-commerce environment consumers sell their online goods to other consumers.

3 Quality engineering (QE):

Software Quality engineering is the management, development, operation and maintenance of IT systems and enterprise architectures with a high quality standard.

Since E-commerce is performed through a web interface, it is evident that e-commerce quality is related to the quality of the web pages and the services that are provided to the end user.

3.1 Software quality engineering steps:

1. Quality planning: make a plan for quality to follow.
2. Quality assurance: Execution of selected QA activities.
3. Quality control: measurement and analysis to provide convincing evidence to demonstrate software quality to all parties involved.

3.2 Quality models:

In software engineering, there are a number of quality models in which they contain a number of quality characteristics (or factors, as called in some models). These quality characteristics could be used to reflect the quality of the software product from the view of that characteristic, selecting which one of the quality models to use is a challenge.

3.3 Quality models examples:

1. McCall's Quality Model.
2. Boehm's Quality Model.
3. Dromey's Quality Model.
4. FURPS Quality Model.
5. ISO 9126 Quality Model.

3.3.1 McCall's Quality Model:

McCall's Quality Model (also known as the General Electric's Model of 1977) is one of the most known quality models in the software engineering. This model originates from the US military and is primarily aimed towards the system developers and the system development process. Using this model, McCall attempts to bridge the gap between users and developers by focusing on a number of software quality factors that reflect both the users' views and the developers' priorities. The structure of the McCall's quality model consists of three major perspectives (types of quality characteristics) for defining and identifying the quality of a software product, and each of these major perspectives consists of a number of quality factors. Each of these quality factors has a set of quality criteria, and each quality criteria could be reflected by one or more metrics.

it consists of 11 quality factors to describe the external view of the software (from the users' view), 23 quality criteria to describe the internal view of the software (from the developer's view) and a set of Metrics which are defined and used to provide a scale and method for measurement.

The main objective of the McCall's Quality Model is that the quality factors structure should provide a complete software quality picture. The actual quality metric is computed by answering "yes" and "no" questions. However, if answering equally amount of "yes" and "no" on the questions measuring quality criteria, then you will achieve 50% on that quality criteria.

3.3.2 Boehm's Quality Model:

Boehm introduced his quality model to automatically and quantitatively evaluate the quality of software. This model attempts to qualitatively define the quality of software by a predefined set of attributes and metrics. It consists of high-level characteristics, intermediate-level characteristics and lowest-level (primitive) characteristics, which contribute to the overall quality level.

The high-level characteristics represent basic high-level requirements of actual use to which evaluation of software quality could be put. In this high-level, there are three characteristics.

In the intermediate level characteristic, there are seven quality characteristics that together represent the qualities expected from software.

The primitive characteristics are 15, and it can be used to provide the foundation for defining quality metrics, this use is one of the most important goals established by Boehm when he constructed his quality model. One or more metrics are supposed to measure a given primitive characteristic.

Boehm defined the 'metric' as "a measure of extent or degree to which a product possesses and exhibits a certain (quality) characteristic."

3.3.3 Dromey's Quality Model:

This quality model has been presented by Dromey [1995, 1996]. It is a product based quality model that recognizes that quality evaluation differs for each product and that a more dynamic idea for modeling the process is needed to be wide enough to apply for different systems. It consists of four software product properties and for each property there is a number of quality attributes.

3.3.4 FURPS Quality Model:

The FURPS model originally presented by Robert Grady [1992], then it has been extended into FURPS+, where the '+' indicates such requirements as design constraints, implementation requirements, interface requirements and physical requirements. In this quality model, the FURPS stands for five characteristics.

3.3.5 ISO 9126 Quality Model:

It classifies software quality in a structured set of characteristics and sub-characteristics.

Each quality sub-characteristic is further divided into attributes. An attribute is an entity which can be verified or measured in the software product. Attributes are not defined in the standard, as they vary between different software products.

3.4 Implement quality in E-commerce systems:

3.4.1 Quality planning:

Setting quality goals by matching customer's quality expectations with what can be economically achieved by the software development, by filling the factors table, based on e-commerce system type.

3.4.2 Quality assurance:

Making sure the filled table is implemented in the implementation phase through the software development life cycle.

3.4.3 Quality control:

In this step, we make sure we got the desired results by processes assessments and process feedback, evaluating the system by feedback to continue the iterative process of developing the e-commerce systems.

4 Literature review:

4.1 E-Commerce System Quality Assessment using a Model based on ISO 9126 and Belief Networks:

A research, presented a model for assessing the quality of e-commerce systems. The proposed model is for the analysis of user-centered quality characteristics of e-commerce systems. The research conducted a quality assessment of e-commerce systems following the ISO 9126 quality factors (Ruhe, 2009) and emphasizing on the user-centered factors of functionality, usability, reliability and efficiency. It presents the decomposition of each of the aforementioned factors in specific characteristics of e-commerce systems. The other part of the model uses Belief (Bayesian) Networks (a probabilistic graphical model, it's a type of statistical model that represents a set of random variables and their conditional dependencies via a directed acyclic graph (DAG)) (Bayesian network, 2016) and consists of two alternative evaluation processes, the forward and backward use. It can be used to combine end users' evidences and provide reasoning from effect to cause and vice versa.

Especially its backward use helps the developer to identify the importance of each feature based on the end user's perception of quality and

subsequently value the association of each probability measure to technology components of the system. (Antonia Stefani, Michalis Xenos, 2008).

4.2 Key Factors for Developing a Successful e-commerce website:

A research provided a framework to establish quality factors in terms of attributes, in addition to their level of importance based on the opinion of highly skilled professionals. The methodology of research was to identify, qualify, and rank these factors.

Identifying:

The foundation model used to identify quality factors and attributes is based on research by Albuquerque and Belchior (AB, 2002).

The model is extended with further research investigation and expert reviews and interviews. Quality factors and attributes were researched to ensure having a comprehensive list of quality factors.

Qualifying:

A rating system was established for the factors, a standard statistical rating scheme based on frequency of expert rating was used to reflect the relative importance of the different sub-factors within a factor. The weighting system was generated based on questionnaire results from expert specialists in E-commerce development and representative consumers of Ecommerce.

Ranking:

The rating of sub-factors was done within each factor. The rating is sequentially based on the order of the importance of the sub-factors in their influence on the factor.

The survey and analysis that has been conducted enabled a greater understanding of the inter-relations and influences the sub-factors have on the main quality factors, the final rating achieved has the highest percentage given to the most important sub-factor as the key factors to assessing the qualities of an E-commerce website, proceeding to the least important in a descending fashion.

The results provided an important foundation for the understanding of quality in E-commerce websites that will allow developers to assess the strengths and weaknesses of their sites in order to know where to focus further development to achieve the high quality needed for Ecommerce success (Osama Mohammed Ahmad, Fawaz Ahmad Masoud, 2010).

4.3 Significant Success Factors of E-Commerce Exterior Factors Proceeding to Situation of Corporate Sectors:

A research aims to review the studies of Significant Success factors of the E-Commerce, and to identify Significant Success factors, which are out of the framework of business management. These factors cannot control or managed by the company.

It is five factors: culture, religion, personal characteristic, language, and governmental supports (Pushpendra Kumar Rawat, Dr. Abhay Upadhayay, Dr. A.K. Tiwari, 2013).

4.4 Software Quality Assurance – E-commerce Customers Satisfaction in Requirements Engineering Process:

In the requirement analysis phase, good quality requirements are needed to develop the foundation of good quality software. This research proposed quality attributes from the SQA activities in requirement phase from the end users' perspective in an e-commerce application. By analyzing SQA activities in requirement engineering process, they found out five quality attributes that most affect customer's satisfaction, these attributes are gained from the requirements elicitation, requirements documentation, requirements validation, negotiation and the requirements management planning activities. The results showed that functionality, security, usability, reliability and efficiency affect e-commerce customers' satisfaction.

Most of the online shopping websites comply with customer requirement and requirement expectations (Wan Nurhayati Wan Ab. Rahman, Asma' Badrul Kamal, Hazliana Talha, Bunjo Josiah, Lawal Adamu, Wu Liming, Nur Sakinah Mohd Rosli, 2015).

4.5 Quality Models in Software Engineering Literature, An Analytical and Comparative Study:

Rafa E. Al-Quraysh's research (Al-Qutaish, 2010) 5 quality models have been compared:

1. McCall's Quality Model.
2. Boehm's Quality Model.
3. Dromey's Quality Model.
4. FURPS Quality Model.
5. ISO 9126 Quality Model.

The comparison between the availability of the characteristics (called factors or attributes in some quality models) within the five quality models is as the following Table (2:1), at the end of table number of the corresponding characteristics for each quality model.

Table (2:1) the characteristics of quality models

Factors/ attribute/ characteristic	McCall	Boehm	Dromey	FURPS	ISO9126
Maintainability	Yes		Yes		Yes
Flexibility	Yes				
Testability	Yes	Yes			
Correctness	Yes				
Efficiency	Yes	Yes	Yes		Yes
Reliability	Yes	Yes	Yes	Yes	Yes
Integrity	Yes				
Usability	Yes		Yes	Yes	Yes
Portability	Yes	Yes	Yes		Yes
Reusability	Yes		Yes		
Interoperability	Yes				
Human Engineering		Yes			
Understandability		Yes			
Modifiability		Yes			
Functionality			Yes	Yes	Yes
Performance				Yes	
Supportability				Yes	
Number of factors	11	7	7	5	6

4.5.1 Summary of model's factors:

1. From the 17 characteristics, only one characteristic is common to all quality models, that is, the Reliability.
2. There are only three characteristics (Efficiency, Usability and Portability) which are belonging to four quality models.

3. Two characteristic is common only to three quality models, that is, the Functionality and Maintainability.
4. Two characteristic belong to two quality models, the Testability and Reusability.
5. Nine characteristics (Flexibility, Correctness, Integrity and Interoperability in McCall's quality model; Human engineering, Understandability and Modifiability in Boehm's quality model; Performance and Supportability in FURPS quality model) are defined in only one quality model.
6. Testability, Interoperability and Understandability are used as factors/attributes/characteristics in some quality models. However, in ISO 9126-1, these factors/attributes/characteristics are defined as sub characteristics. More specifically, the Testability is belonging to the Maintainability characteristic, Understandability is belonging to the Usability characteristic, and the Interoperability is belonging to the Functionality characteristic.

4.5.2 About the models:

1. In McCall's quality model, the quality is subjectively measured based on the judgment on the person(s) answering the questions ('yes' or 'no' questions).
2. Three of the characteristics are used in the ISO 9126-1 quality model as sub-characteristics from other characteristics.
3. The FURPS quality model is built and extended to be used in the IBM Rational Software Company. Therefore, it is a special-purpose quality model, that is, for the benefits of that company.
4. The metrics in the lower level of the McCall's, Boehm's, Doromey's and FURPS quality models are neither clearly nor completely defined and connected to the upper level of the quality models. For example, in McCall's quality model, the metrics should be clearly and completely defined and connected to the corresponding quality criteria.
5. The ISO 9126-1 quality model is the most useful one since it has been build based on an international consensus and agreement from all the country members of the ISO organization.

1 Introduction:

In this chapter researcher will explain the methodology of research, data collection method that has been used, how data collection method was validated and how reliable it was.

2 Research methodology:

The research methodology that the researcher used is qualitative; it involves describing in details specific situation using research tools like questionnaire and Observations, qualitative Research is primarily exploratory research (Wyse, 2011).

3 Data collection method:

The researcher issued a questionnaire; online (using Google forms) and offline (paper based) to get the data for the research, she used the questionnaire because it is one of the most reliable data collection methods, and the questionnaire proved and covered the entire research hypothesis.

4 Data collection method validity and reliability:

It means that the questionnaire has accomplished the goal that it designed for, and hence achieve the objectives of the research, and it hypotheses, the reliability of the questionnaire measured by two ways:

4.1 Content validity:

The researcher has issued the questionnaire to a number of specialists who evaluated it and eventually agreed on a 44 question, partitioned as following:

- a. General questions: about the age, gender, educational level, work status and salary, from Q1 to Q5.

- b. The types of e-commerce systems that are used in Sudan, how people get to know it, how frequently they use it, do they have bank accounts and electronic purse, do they prefer to use traditional commerce over Electronic commerce, and finally how important is the quality concept for them in E-commerce systems from Q6 to Q13.
- c. The obstacles that make it hard for people to use e-commerce systems in Sudan, 14 obstacles (14 Questions).
- d. Ways to encourage people to use E-commerce systems in Sudan, seven ways (7 Questions).
- e. Ways to help spread the concept of quality in Sudan among E-commerce systems, 10 ways (10 questions).

4.2 Cronbach's Alpha:

Cronbach's alpha is the most common measure of internal consistency ("reliability"). It is most commonly used when you have multiple Likert questions in a survey/questionnaire that form a scale and you wish to determine if the scale is reliable by keeping the questions that have high Cronbach's Alpha and eliminate the questions with low or negative Cronbach's Alpha, this analysis is done by using SPSS program (Brinkman, 2009).

5 Questionnaire reliability analysis:

The three hypotheses that have been analyzed and got the alpha factor to prove them, are shown below, and as mentioned, the alpha factor has to be more than 0.2, that is how it is going to be considered valid and reliable.

5.1 The obstacle that makes it hard for people to use E-commerce systems in Sudan

Table (3:1) Reliability of the hypothesis (the obstacles that makes it hard for people to use e-commerce systems in Sudan)

#	Question	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
1	Electronic literacy	26.7258	67.7433	.4890	.8589
2	High cost of internet	26.3548	63.6097	.5572	.8550
3	Lack of electronic payment facilities for enabling transfer of funds	26.2903	66.0783	.4372	.8618
4	Imperfect legal system and policy barriers	26.6290	66.6634	.5877	.8547
5	Limited access to telecommunication infrastructure	26.2581	63.2766	.6388	.8503
6	Limited access to personal computers	25.2903	64.2750	.5188	.8573
7	Lack of online culture	26.2581	66.3258	.4392	.8615
8	American sanction	26.4677	67.1711	.3946	.8639
9	Insecurity	26.3226	64.7467	.5981	.8529
10	Not trusting online shops	26.1613	63.9736	.5919	.8529
11	Not trusting money transactions through internet	26.2581	64.8503	.5293	.8565
12	Low internet speed	26.6129	66.4379	.5102	.8576
13	Non-verified online shops	26.2581	65.7028	.6479	.8519
14	Lack of effective promotions	26.5161	66.0243	.4396	.8617

Reliability Coefficients

N of Cases = 62.0

N of Items = 14

Alpha = .8658

5.2 Ways to encourage people to use E-commerce systems in Sudan

Table (3:2) Reliability of the hypothesis (Ways to encourage people to use E-commerce systems in Sudan)

#	Question	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
1	High internet speed	8.0000	5.6250	.3859	.7128
2	Low internet prices	7.8462	6.1947	.0751	.8116
3	Verified online shops	7.8308	5.7990	.4033	.7082
4	Easy to use e-commerce systems	8.0154	5.3904	.7588	.6479
5	Provide safe online payment method	8.0000	5.2187	.7055	.6462
6	Provide more variety of product options	7.8154	4.4341	.7579	.6084
7	Availability of delivery option	7.8769	5.9221	.3355	.7225

Reliability Coefficients

N of Cases = 65.0

N of Items = 7

Alpha = .7308

5.3 Ways to help spread concept of quality in Sudan among E-commerce systems

Table (3:3) Reliability of the hypothesis (Ways to help spread concept of quality in Sudan among E-commerce systems)

#	Question	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
1	Hire good specialists	14.3538	15.2322	.3843	.7942
2	Encourage developers to apply quality standards	14.2308	14.2428	.6339	.7710
3	Make sure standards being followed by evaluation by organizations	14.2154	13.3904	.6748	.7614
4	Change developer's attitude toward quality	14.0923	14.4913	.4017	.7935
5	Customize quality models and make them easy to follow	14.1077	13.4726	.5600	.7742
6	Encourage people to ask for systems with high quality by using rating feature	14.3231	14.8784	.4399	.7888
7	Using feedback feature	14.3385	13.7587	.5637	.7742
8	Make the feedback periodic surveys seeking feedback	14.1077	14.0663	.4451	.7890
9	Offer rewards for feedback, small discount, or promotional items	14.1846	15.4654	.2179	.8143
10	Verify online shops that follow quality standards	14.2462	13.5947	.5149	.7802

Reliability Coefficients

N of Cases = 65.0

N of Items = 10

Alpha = .8019

The column (Corrected item- total Correlation) Illustrates the Cronbach's alpha for each question separately, and at the end of every table, there is the total Alpha factor for each hypothesis.

As Illustrated in the tables; all the Cronbach's Alpha are high for the entire hypothesis, what proves statistically the reliability and validity of the questionnaire.

6 The proposed quality model:

Proposed quality model will contain number of factors that the users care about and consider it important.

Quality factors will be derived out of the questionnaire-collected data, the factors that the model is proposing is for quality of e-commerce systems.

1 Introduction:

This chapter the researcher will demonstrate the results of questionnaire, and the analysis of results, to extract the quality factors needed by users, to guarantee they will have pleasant experience using E-commerce systems.

2 Results of research's questionnaire:

The case study contained 70 questionnaires (55 offline, 15 online), 65 were filled, 3 questionnaires not returned, and 2 were statistically wrong and contained invalid data.

The case study was made of people who use the E-commerce systems, and it was a little hard to find them, because the concept of E-commerce system is not well known for people in Sudan, and it is one of the proved obstacles in one of the research hypotheses.

The results were as the following:

As shown in the table below; we can notice that the case study contained 58.5 % males, and 41.5% females, and that shows that people from the two genders use E-commerce in Sudan.

Table (2:1) Distribution according to sex

	Frequency	Percent
Male	38	58.5
Female	27	42.5
Total	65	100.0

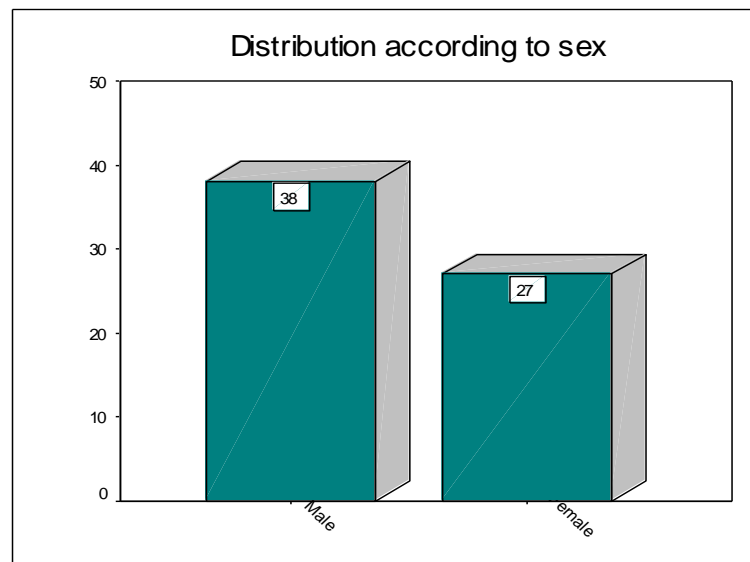


Figure (2:1) Distribution according to sex

For people ages, the range was 24, the youngest one was 16 years old, and the oldest was 40, one of the people in the case study didn't fill that answer, that is why the total number who stated their age was 64.

Table (2:2) Descriptive statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Age in complete years	64	24	16	40	25.22	5.025

The distribution of the case study according to educational level; revealed that 4.6 % attended to the high school level, 67.7 % attended to university level(graduated), and 27.7 % attended post graduate level (Master, PhD, post-doctoral), all of the 65 people has answered this question.

Table (2:3) Distribution according to educational level

	Frequency	Percent	Cumulative present
High school	3	4.6	4.6
Graduated	44	67.7	72.3
Post graduated	18	27.7	100.0
Total	65	100.0	

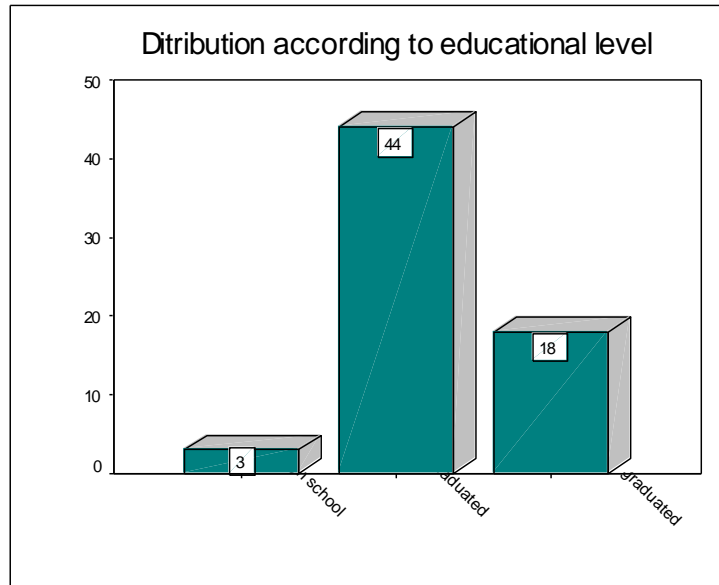


Figure (4:2) distribution according to educational level

The distribution of the case study according to employment status was as the following; 35.4 % are students, 53.8% are employed, and 10.8 % are unemployed, all of the 65 people in the case study answered this question.

Table (4:4) Distribution according to employment status

	Frequency	Percent
Student	23	35.4
Employed	35	53.8
Unemployed	7	10.8
Total	65	100.0

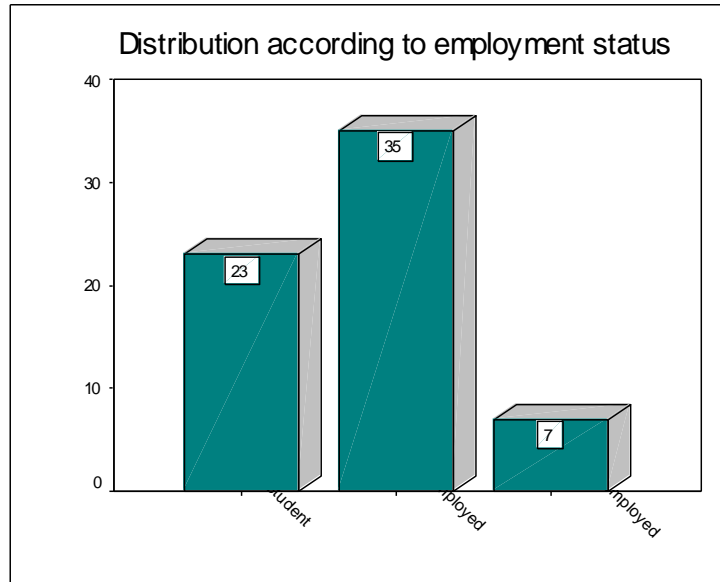


Figure (4:3) Distribution according to employment status

Salary rates among the case study was as the following; with the clarification that this question is not applicable for all the people in the case study, specifically the students, so if the person is a student he/she does not need to answer this question, that is why the total of the people who answered this question was 35 person, distributed as the following; the salary of 17.1% of the 35 person was from 100 – 100 SDG, 40.0% of the 35 person was 1001 – 2500 SDG, 31.4% of the 35 person was 2501 – 5000 SDG, and 11.4% of the 35 person was above 5000 SDG, the percentage of the people who didn't answer because it was not applicable for them is 53.8 % out of the 65 person in the case study.

Table (4:5) Salary rate in SDG

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100_1000	6	9.2	17.1	17.1
	1001_2500	14	21.5	40.0	57.1
	2501_5000	11	16.9	31.4	88.6
	Above 5000	4	6.2	11.4	100.0
	Total	35	53.8	100.0	
Missing	Not applicable	30	46.2		
Total		65	100.0		

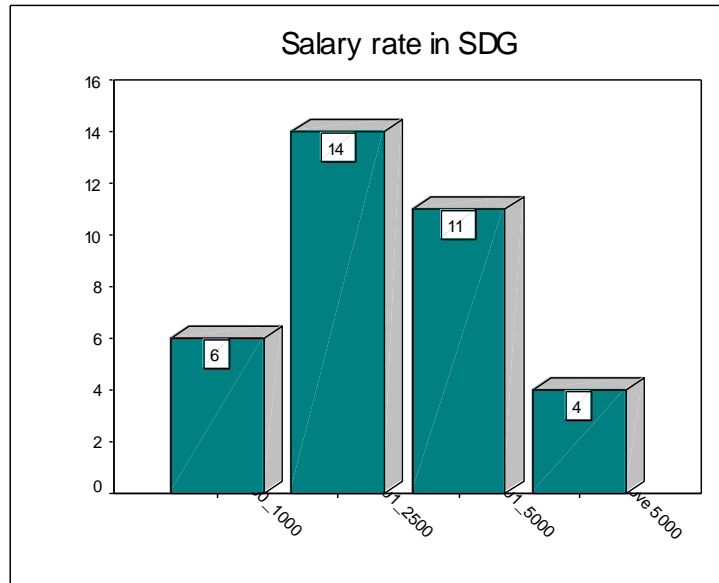


Figure (4:4) Salary rate in SDG

3 Analysis of usage of e-commerce systems in Sudan:

The table below illustrates the e-commerce systems that are used in Sudan by users, the results showed that people are most likely to use Facebook groups and pages as E-commerce systems, by percentage of 43.4 % out of the 65 person, then followed the Instagram accounts by percentage of 21.3 % out of the 65 person, 9.0 % use Souqsu, 8.2 % use Electronic purse, 5.7 % use Smart Delivery, 4.1 % use D-request, 3.3 % use Laha wa Laho, 2.5 % use DigiAds, and 2.5% use other e-commerce systems, such as: Mishwar application, booking online(flights)although it is not e-commerce system used in Sudan, and an application used in a company to pay employees' salaries.

And that means that people in Sudan prefer to use social media as for their e-commerce business because people use it a lot and can access it easily.

Table (4:6) the E-commerce systems used in Sudan

	Frequency	Percent
Electronic purse	10	8.2
DigiAds	3	2.5
Souqsu	11	9.0
Laha wa Laho	4	3.3
D-request	5	4.1
Smart delivery	7	5.7
Facebook groups and pages	53	43.3
Instagram accounts	26	21.3
Others	3	2.5
Total	122	100.0

The way people get to know these systems is via their friends, social media, email and other, and the percentage of each shown in the table below, as we can see the total of the people in this question is 73, that is because some of them get too now the e-commerce systems by more than one way, what lead to the possibility of making a multiple-choice answer.

Table (4:7) how people get to know about the e-commerce systems they have used

	Frequency	percent
From a friend	20	27.4
Via social media	44	60.3
via Email	5	6.8
Other	4	5.5
Total	73	100.0

In terms of accessing those systems; through one or more of the following; by mobile phone 55.0 % out of the 65 persons, by personal computers 30.0 % out of the 65 persons, and by desktop computer 15% out of the 65 persons in the case study, as shown in the table below, the total of people in this question was 100, because it is a mustachioed question:

Table (4:8) devices used to access e-commerce

	Frequency	Percent
mobile phone	55	55.5
Personal computer	30	30.0
Desktop computer	15	15.0
total	100	100.0

This question revealed that 60% out of the 65 persons in the case study prefer to use E-commerce systems rather than the traditional commerce systems, with one person who didn't answer this question.

Table (4:9) e-commerce vs traditional commerce preferability

		Frequency	Percent	Valid Percent
Valid	E-commerce	39	60.0	60.9
	Traditional commerce	25	38.5	39.1
	Total	64	98.5	100.0
Missing	Not Determined	1	1.5	
Total		65	100.0	

This question shows how often people use e-commerce systems, a high percentage said they use it a few times a year, a percentage of 48.4 % out of 64 people in the case study, because there is one person who didn't

answer this question, there is an option in this question said Never, the explanation of this choice is these people never really used e-commerce systems, but they know it, and check it every once in a while, but didn't actually buy using E-commerce systems.

Table (4:10) how often people use e-commerce systems

		Frequency	Percent	Valid Percent
Valid	Daily basis	5	7.7	7.8
	Weekly basis	8	12.3	12.5
	Monthly basis	10	15.4	15.6
	Few times in a year	31	47.7	48.4
	Never	10	15.4	15.6
	Total	64	98.5	100.0
Missing	Not Determined	1	1.5	
Total		65	100.0	

This question illustrated the degree of concerned quality by people, 46.2 % said they are very concerned of it, 40.0 % said they are somewhat concerned, 9.2 % said they are little concerned, and 4.6 % said they are not concerned about it.

Table (4:11) degree of concerned quality

	Frequency	Percent	Calmative
Very concerned	30	46.2	46.2
Somewhat concerned	26	40.0	86.2
Little concerned	6	9.2	95.4
Not concerned	3	4.6	100.0
Total	65	100.0	

People who have bank account represent 64.6 %, and who don't have bank accounts represents 35.4 % of the 65 persons in the case study, it means that a high percentage of people do have bank account.

Table (4:12) percentage of people who have bank account

	Frequency	Percent
Yes	42	64.6
No	23	35.4
Total	65	100.0

Low percentage of people have electronic purse, which can be used to facilitate the online payments, and it 23.1% out of the 65 persons in the case study, the high percentage of 76.9 % don't have electronic purse, and that mean we need to make people more aware of it and of using it.

Table (4:13) percentage of people who have electronic purse

	Frequency	Percent
Yes	15	23.1
No	50	76.9
Total	65	100.0

4 Proving hypotheses:

To test each of the following three hypotheses, the percentage of case study answers that is related to each of the hypotheses to determine to what extent people agreed or disagreed.

4.1 The obstacles that makes it hard for people to use e-commerce systems in Sudan:

The table aims to find the obstacles that makes it hard for Sudanese to use e-commerce systems in Sudan, 53.1 % strongly agreed that it is because of the electronic literacy, 46.2 % strongly agreed that it is because of the high cost of internet, 46.2% strongly agreed that it is because of the imperfect legal system and policy barriers, 47.7 % strongly agreed that it is because of the American sanction, 53.1 % strongly agreed that it is because of the low internet speed, and also 52.3% strongly agreed that it is because of the lack of the effective promotion for e-commerce system , but in the cause of the limited access to the personal computer; a high percentage didn't agree, and also strongly didn't agree, which means it is not an obstacle for people to have personal computers, for all the reasons people agreed and strongly agreed in a high percentage and that proves the hypotheses.

Table (4:14) obstacles that makes it hard for people to use e-commerce systems in Sudan

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Electronic literacy	Count	34	25	2	2	1	64
	%Percent	53.1%	39.1%	3.1%	3.1%	1.6%	100.0%
High cost of internet	Count	30	20	7	5	3	65
	%Percent	46.2%	30.8%	10.8%	7.7%	4.6%	100.0%
Lack of Electronic payment facilities for enabling transfer of funds	Count	27	20	12	3	3	65
	%Percent	41.5%	30.8%	18.5%	4.6%	4.6%	100.0%
Imperfect legal system and policy barriers	Count	30	25	9	0	1	65
	%Percent	46.2%	38.5%	13.8%	.0%	1.5%	100.0%
Limited access of Telecommunication infrastructure	Count	24	20	14	6	1	65
	%Percent	36.9%	30.8%	21.5%	9.2%	1.5%	100.0%
Limited access to Personal Computers	Count	4	21	17	13	10	65
	%Percent	6.2%	32.3%	26.2%	20.0%	15.4%	100.0%
Lack of online culture	Count	22	23	11	8	1	65
	%Percent	33.8%	35.4%	16.9%	12.3%	1.5%	100.0%
American sanction	Count	31	17	11	3	3	65
	%Percent	47.7%	26.2%	16.9%	4.6%	4.6%	100.0%
insecurity	Count	23	24	12	4	2	65
	%Percent	35.4%	36.9%	18.5%	6.2%	3.1%	100.0%
Not trusting online shops	Count	20	23	11	8	2	64
	%Percent	31.3%	35.9%	17.2%	12.5%	3.1%	100.0%
Not trusting money transactions through internet	Count	23	23	8	10	1	65
	%Percent	35.4%	35.4%	12.3%	15.4%	1.5%	100.0%
Low internet speed	Count	34	20	6	3	1	64
	%Percent	53.1%	31.3%	9.4%	4.7%	1.6%	100.0%
Not verified online shops	Count	15	34	13	2	1	65
	%Percent	23.1%	52.3%	20.0%	3.1%	1.5%	100.0%
Lack of effective promotions	Count	34	19	6	3	3	65
	%Percent	52.3%	29.2%	9.2%	4.6%	4.6%	100.0%

4.2 Ways to encourage people to use e-commerce systems in Sudan:

The next table illustrates how people strongly agreed on all of the questions of this hypothesis in a very high percentage, and most of the disagree and strongly agreed columns had the value 0, and that proves the hypothesis, so the ways to encourage people to use e-commerce systems in Sudan is as listing below:

Table (4:15) ways to encourage people to use E-commerce systems in Sudan

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
High internet speed	Count	55	7	1	2	0	65
	%Percent	84.6%	10.8%	1.5%	3.1%	.0%	100.0%
Low internet prices	Count	49	11	2	2	1	65
	%Percent	75.4%	16.9%	3.1%	3.1%	1.5%	100.0%
Verified online shops	Count	41	22	2	0	0	65
	%Percent	63.1%	33.8%	3.1%	.0%	.0%	100.0%
Easy to use E-commerce systems	Count	52	12	1	0	0	65
	%Percent	80.0%	18.5%	1.5%	.0%	.0%	100.0%
Provide safe online payment method	Count	52	12	0	1	0	65
	%Percent	80.0%	18.5%	.0%	1.5%	.0%	100.0%
Provide more variety of product options	Count	45	14	5	1	0	65
	%Percent	69.2%	21.5%	7.7%	1.5%	.0%	100.0%
Availability of delivery option	Count	45	17	3	0	0	65
	%Percent	69.2%	26.2%	4.6%	.0%	.0%	100.0%

4.3 Ways to help spread concept of quality in Sudan among E-commerce systems:

The next table illustrates how people strongly agreed and agreed to the questions of this hypothesis with high percentage, some of the ways are: using feedback feature, hiring good specialists, verifying online shops that follow quality standards, the rest are shown in table below:

Table (4:16) ways to help spread the concept of quality in Sudan among e-commerce systems

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Hire good specialist	Count	38	25	2	0	0	65
	%Percent	58.5%	38.5%	3.1%	.0%	.0%	100.0%
Encourage developers to Apply quality standers	Count	30	33	2	0	0	65
	%Percent	46.2%	50.8%	3.1%	.0%	.0%	100.0%
make sure standards being followed by evaluation	Count	34	24	7	0	0	65
	%Percent	52.3%	36.9%	10.8%	.0%	.0%	100.0%
Change developers attitudes toward quality	Count	28	29	7	1	0	65
	%Percent	43.1%	44.6%	10.8%	1.5%	.0%	100.0%
Customize quality models and make them easy to follow	Count	30	27	6	2	0	65
	%Percent	46.2%	41.5%	9.2%	3.1%	.0%	100.0%
Encourage people to ask for systems with high quality by using rating features	Count	37	25	3	0	0	65
	%Percent	56.9%	38.5%	4.6%	.0%	.0%	100.0%
Using feedback feature	Count	42	17	5	1	0	65
	%Percent	64.6%	26.2%	7.7%	1.5%	.0%	100.0%
Make the feedback periodic surveys seeking feedback	Count	29	29	6	0	1	65
	%Percent	44.6%	44.6%	9.2%	.0%	1.5%	100.0%
Offer rewards for feedback, small discount, or promotional items	Count	33	25	6	1	0	65
	%Percent	50.8%	38.5%	9.2%	1.5%	.0%	100.0%
Verify online shops that follow quality standards	Count	38	21	3	3	0	65
	%Percent	58.5%	32.3%	4.6%	4.6%	.0%	100.0%

5 Summary of results (case study analysis):

Table (4:17) Results of the case study analysis

Hypothesis	Questions related to hypothesis	Results
Types of e-commerce systems that are most used in Sudan	what are the E-commerce systems that you've used?	people are most likely to use Facebook groups and pages as E-commerce systems, by
	How did you hear about the e-commerce systems you used?	percentage of 43.4 % out of the 65 persons, and
	The way you access the E-commerce systems!	with a percentage of 60.3% they get to know these systems via social media,
	Do you prefer e-commerce or traditional commerce	most of them use mobile phone to access these systems by a percentage of 55.5%, 60.9%
	How often you use e-commerce systems?	has declared they prefer to use e-commerce systems rather than traditional commerce, but at the same time they said they used just a few times a year by a percentage of
	Degree of concerned quality	
	Do you have bank account?	
	Do you have e-purse?	

		48.4%, and also the results showed that a high percentage of people do concern about quality and have bank accounts, but only few people have e-purse.
Obstacles that makes it hard for people to use e-commerce systems in Sudan	Electronic literacy	The results showed that the obstacles that makes it hard for Sudanese to use e-commerce systems in Sudan: 53.1 % strongly agreed that it is because of the electronic literacy,46.2 % strongly agreed that it is because of the high cost of internet, 46.2% strongly agreed that it is because of the imperfect legal system and policy barriers, 47.7 % strongly agreed that it is because of the
	High cost of internet	
	Lack of Electronic payment facilities for enabling transfer of funds	
	Imperfect legal system and policy barriers	
	Limited access of Telecommunication infrastructure	
	Limited access to Personal Computers	
	Lack of online culture	
	American sanction	
	insecurity	
	Not trusting online shops	

	Not trusting money transactions through internet	American sanction, 53.1 % strongly agreed that it is because of the low internet speed, and also 52.3% strongly agreed that it is because of the lack of the effective promotion for e-commerce system , but in the cause of the limited access to the personal computer; a high percentage didn't agree, and also strongly didn't agree, which means it is not an obstacle for people to have personal computers, for all the reasons people agreed and strongly agreed in a high percentage and that proves the hypotheses.
Low internet speed		
Not verified online shops		
Lack of effective promotions		
	High internet speed	

Ways to encourage people to use e-commerce systems in Sudan	Low internet prices	The result had illustrated how people strongly agreed on all of the questions of this hypothesis in a very high percentage, and most of the disagree and strongly agreed columns had the value 0, and that proves the hypothesis, so the ways to encourage people to use e-commerce systems in Sudan is as the questions of this hypothesis
	Verified online shops	
	Easy to use E-commerce systems	
	Provide safe online payment method	
	Provide more variety of product options	
	Availability of delivery option	
Ways to help spread concept of quality in Sudan among E-commerce systems	Hire good specialist	The result had illustrated how people strongly agreed and agreed to the questions of this hypothesis with high percentages, some of the ways are: using feedback feature, hiring good specialists,
	Encourage developers to Apply quality standers	
	make sure standards being followed by evaluation	
	Change developer's attitudes toward quality	
	Customize quality models and make them easy to follow	
	Encourage people to ask for systems with high quality by using rating features	

	Using feedback feature	verifying online shops that follow quality standards, and the rest are shown questions of this hypothesis.
	Make the feedback periodic surveys seeking feedback	
	Offer rewards for feedback, small discount, or promotional items	
	Verify online shops that follow quality standards	

6 E-commerce systems in Sudan (characteristic's analysis:

Sudan is a third world country, so the concept of E-commerce in it may not be clear as the concept of the traditional commerce, as it is addressed by the questionnaire results, due to some difficulties that face all the third world countries that also addressed in the questionnaire, the E-commerce systems that are used by people in Sudan was as the following, each one with the usage rate:

1. Electronic purse (8.2%).
2. DigiAds (2.5%).
3. Souqsu (9%).
4. Laha wa laho (3.3%).
5. D-request (4.1%).
6. Smart delivery (5.7%).
7. Facebook groups and pages (43.4%).
8. Instagram accounts (21.3%).
9. Other (2.5%).

6.1 Electronic purse:

It is a purse, but it is electronic, the way it works is similar to credit cards way of work, but having a bank account is not necessary in E-wallets, because it's going to create one automatically, services that can be done using E-wallet are as the following:

Buying electricity, buying mobile credit (Zain, MTN, Sudani), pay bills (mobile, governmental, higher education admission fees), money transfer, deposit and withdraw, and buying goods using the wallet in its Service

outlets, You can recharge it through POS point of sales of almahfaza, or ATM machines that supports it (almahfaza, n.d.).

6.2 DigiAds:

It is a Sudanese community-based mobile application that combines deals, offers, bargains and company directories in one place.

It allows you to browse through brand-names, electronics, accessories, and beauty products. The app lets you shop anytime, anywhere, so you never miss a great deal. Some of the great features: Be the first to know when new deals and events go live! By activating notifications. Browse through hundreds of fantastic items all at your fingertips, Fast access to the easy to use checkout – Share, tweet, post, and earn fantastic DigiAds rewards on your mobile device, own your personal page in the application Introduce your services easily through the application Notifications of special events, launches, and more There are new deals and amazing new events each and every day, and DigiAds will be the first to communicate it with its users.

The special feature in this system is the availability of online payment which is very rare in Sudan, and that is through the electronic purse. You can download this application from this link below: <https://digiads.info/download/>.

6.3 Souqsu:

This system has a website and a mobile application that contain Saudi product from Saudi markets, the products are with a good quality and the prices are affordable.

If you want to make an order you have to make account, add personal information and continue to submit the order.

Delivery will be within 24- 72 hours, and payment is when you receive the order, www.souqsu.com.

6.4 Laha wa laho:

A website that displays a lot of products: cars, houses, real estates, you can also advertise anything you have like furniture, clothes, beauty products, computer, also you can offer services like: wedding planning, building companies, so it's an advertising web site where you have to display your product and leave all the information about you so the potential buyer can contact you and make the deal, www.lahawalaho.com.

6.5 D-request:

D-Request.com is a leading online delivery service provider that operates in Sudan. They provide an easy, fast way to connect customers with their favorite restaurants, it takes just few clicks from the computer to place an order through D-Request.com or through the application from your preferred restaurants, and when the food is ready, the restaurant delivers it or you pick it up. All you have to do is sign for it and enjoy it! No menus, no phone calls, no repeating yourself, they provide an easy, fast way to connect customers with their favorite restaurants.

There is an application and a website: www.d-request.com.

6.6 Smart delivery:

Android application to sell fruit, vegetables and meat, they are taking out the intermediate traders (farmer to consumer), with higher quality and lower price, orders are collected through the week, to be delivered in every Sunday, Tuesday and Friday, and the prices are updated daily.

<https://play.google.com/store/apps/details?id=com.semicolon.sda&hl=en>.

6.7 Facebook groups and pages:

A lot of merchants who own small to medium businesses prefer to use Facebook as an online shop, Facebook provides: groups and pages feature, where you just have to upload the photos of your product, and write the product information, the customers have to place the orders, by sending a private messages or using WhatsApp application according to the way the dealer prefer, Facebook is one of the most used

social website on Sudan that attract so high traffic, because it's easy to use, most of telecommunication companies make special offers for it with less internet needed, that's why you will guarantee that your product will reach to a wider audience, www.facebook.com.

6.8 Instagram accounts:

Another social media website that is usually used to make online shops and it's similar to the way the process of e-commerce done in Facebook, but in Instagram you will have to make an account then promote for it through hashtags, www.instagram.com.

7 Features of e-commerce systems in Sudan:

Here are the features that are we going to use to classify the e-commerce systems, and all are mentioned in the table below:

E-commerce type 1:

1. B2B
2. C2C
3. B2C
4. C2B

E-commerce type 2:

1. Whole: all the parts of the process are done digitally, like buying an electronic book from an online store and pay through a credit card.
2. Partial: when some parts of the process are done traditionally and the others are digitally, like buying clothes from an online shop, and pay cash.

Website:

Website for the system? Yes /No.

Application:

A mobile application for the system? Yes /No.

Product type 1:

Is the product being offered is tangible or digital?!

Product type 2:

The product type in exact, clothes, food, cosmetics...etc.

Payment method:

Cash /E-purse.

Delivery availability:

Does the system offer delivery feature? Yes /No.

Delivery time:

How long did it take to deliver the product?

Product image:

In websites or mobile application, is there is an image for the product?
Yes /No.

Product description:

Is there is a clear description of the product in the website or in mobile application? Yes /No.

Product reviews:

Does the system have the feature of the customer reviews of the product?
Yes /No.

Business use:

The product being offered is for business use? Yes /No.

Personal use:

The product being offered is for personal use? Yes /No.

Table (4:18) e-commerce systems characteristics

The system	Lahawlaho	Smart delivery	D-request	Facebook	Instagram	Souqsu	E-wallet	DigiAds
System feature								
E-commerce type 1	C2C	B2C	B2C	C2C	C2C	B2C	B2C B2B	C2C B2C
E-commerce type 2	Partial	Partial	Partial	Partial	Partial	Partial	-	Partial
Web site	Yes	No	Yes	Yes	Yes	Yes	-	yes
Application	No	Yes	Yes	Yes	Yes	Yes	-	yes
Product type 1	Tangible	tangible	Tangible	Tangible	Tangible	Tangible	Both	both
Product type 2	Different	Food	Food	Different	Different	Groceries	Mobile credit – bills	Differe nt
Payment method	cash	Cash	Cash	Cash	Cash	Cash	e- purse	Cash and e- purse
Delivery availability	No	Yes	Yes	-	-	Yes	-	No
Delivery time	-	Within 2 or 3 days	Hour- 2hours	-	-	Within 3 days	-	-
Product image	Yes	Yes	Yes	Yes	Yes	Yes	-	yes
Product description	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product reviews	No	Yes	Yes	No	No	Yes	-	No
Business use	no	Yes	Yes	No	No	Yes	Yes	yes
personal use	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes

7.1 Summary of features of e-commerce systems in Sudan:

1. E-commerce type in Sudan are B2C and C2C.
2. The majority of the systems are partial.
3. Systems implemented as a mobile application are preferable, because most of Sudanese people use mobile phone to easy access to internet, because it is cheap and easy to use.
4. Most products in e-commerce systems are food, clothes, furniture, cosmetics, there is also products like cars, houses, and other but they are not as common as food, clothes, furniture and cosmetics, and almost all products are tangible.
5. Payment method is cash, just one application uses the electronic purse as a payment method, beside the products that are originally can be bought through using e-purse, like buying electricity, and the points of sales where the e-purse is accepted.
6. Most of the systems offer a delivery feature, it is not more than a week in usual.
7. Product image is one of the very critical elements of the process and it is available in all e-commerce systems.
8. Product description also is so important, especially the price of the product.
9. A few of the systems has the product review feature, although we all know the importance of that feature for any e-commerce system, because it helps the customers to have idea about the system quality and the product quality through their experience with using the system.
10. E-commerce systems in Sudan used for personal usage.

1 Introduction:

In this chapter, the proposed quality model will be explained, it contains 10 factors, the reason for choosing each of the factors, factors are:

1. Design neutrality.
2. Social media based E-commerce system.
3. Social media for promotion.
4. Mobile friendly.
5. Availability of online payment method.
6. Lightweight e-commerce system.
7. User guide (usability, understandability).
8. Delivery option availability.
9. Variety of product's options.
10. Rating and feedback features availability.

2 Proposed quality model:

2.1 Design neutrality:

Design should be neutral, because males and females do use e-commerce systems (58.5% males, 42.5 females), and ages are in range 16 – 40, the design should be attractive to different age groups.

2.2 Social media based E-commerce system:

43.4% used e-commerce systems by using Facebook pages or groups (as online shops), and 21.3% used Instagram accounts as E-commerce systems too, so having online shop with social media platform will guarantee a lot of traffic to the merchant.

2.3 Social media for promotion:

60.3% knew about the existing e-commerce by using social media, that is why it is the best way to promote for it, also 52.3% strongly agreed that lack of promotion might be an obstacle for not knowing about E-commerce systems, social media is the best way to promote.

2.4 Mobile friendly:

55.5% percent of people access internet(E-commerce systems) using mobile phones, so the e-commerce system should be mobile friendly.

2.5 Availability of online payment methods:

64.4% percent of people have bank accounts, and in Sudan there is online payment methods, with the two facts mentioned, adding online payment method to e-commerce system will encourage people to use it, and the payment method is safe, then people trust will be gained, because 80 % agreed that if a safe online payment method is available that will encourage them to use e-commerce system, and in the E-commerce systems characteristics table, just one of the systems offer online payment method.

2.6 Lightweight e-commerce systems:

53.1% strongly agreed that low internet speed is one of the obstacles, and the high cost of internet 46.2% strongly agreed on that, so developing lightweight applications that will not consume data would be beneficial.

2.7 User guide (usability-understandability):

53.1% strongly agreed that E-literacy is obstacle, and also lack of online culture is obstacle, providing a simplified user guide will make it easy for people to use e-commerce systems, it can be in one downloadable image with all the instructions shown, and also be choice driven, and it will be easier to understand, 80% agreed that easy to use e-commerce systems will encourage them to use e-commerce systems.

2.8 Delivery option:

69.2% strongly agreed that the availability of delivery option for what they will buy would encourage them to use the system.

2.9 Varsity of options:

Having many product types can be so attractive and encouraging to people, 69.2% percent of people agreed on that.

2.10 Rating and feedback:

64.6% strongly agreed that using feedback feature, 64.4% strongly agreed that using rating feature, and 50.8% strongly agreed that offer rewards or discount when feedback or rating, all of the 3 features will help improve quality and people will demand systems with high quality more, it will act

like a verification for the E-commerce systems, and it was one of people's concern; not trusting online shops, 31.3% percent of people strongly agreed on that.

1 Introduction:

This chapter is about the conclusion and recommendations to apply in the future to this research.

2 Conclusion:

- Quality is so important for software systems, and E-commerce systems one of the critical software systems because payments is part of the it.
- Sudanese do use e-commerce systems.
- Most common to use e-commerce systems in Sudan are social media accounts.
- The availability of electronic payments solutions in Sudan, which may facilitate and encourage making more E-commerce systems.
- Main obstacles that face people when it comes to use e-commerce systems: E-literacy, high Internet cost, imperfect legal system and system barriers.
- High internet speed, low internet cost, verified online shops, and easy to use e-commerce systems are ways going to help people use e-commerce systems more.
- Using feedback feature, and rating feature, hire good specialist are effective ways to help spread concept of quality in E-commerce systems.
- Quality model proposed and it is according to user's likings and behaviors towards using E-commerce systems.

3 Recommendations:

- E-commerce system in Sudan can use the one of the E-payment solutions provided by some companies as a way of safe online payments.
- Systems developers can use Review feature as a feedback.
- Determine measurable metrics for each factor.
- Make simple checklist, it should include the factors and it is metrics so the model be easy to implement.
- Promote for e-commerce systems, by making prizes and awards to encourage people using it.

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Appendices

By the name of Allah

Questionnaire to evaluate the use of E-commerce systems in Sudan

Ladies and gentlemen:

This questionnaire is one of the data collection methods used to get the master degree in Sudan University for science and technology (college of Computer science and Information technology), it aims to collect data about the use of E-commerce systems in Sudan, to know what are the systems that are most used, by whom, what are the obstacles that get in the face of the users of these systems, the importance of quality concept to them, and how to help spread the quality concept.

Thank you in advance for your collaboration.

Researcher

Sara Ahmed Abdelrahman

1. General information:

1. Gender:

1. Male () 2. Female ()

2. Age: (.....)

3. Educational level:

1. Not educated () 2. Primary school () 3. High school ()

4. Graduate () 5. Post graduate ()

4. Are you :
1. Student () 2. Employed ()
 3. Unemployed ()
5. Your salary rate(if employed):
1. 100 – 1000 SD () 2. 1001- 2500 SD()
 3. 2501 – 5000 SD () 4. Above 5000 SD ().

2. The types of e-commerce systems that is most common to use in Sudan by customers range from some mobile applications to social media and other systems.

1. During your use to E-commerce systems in Sudan, what are the systems that you used?

1. Electronic purse ()
2. DigiAds ()
3. Souqsu ()
4. Laha Wa laho website ()
5. D-request ()
6. Smart delivery ()
7. Facebook groups and pages ()
8. Instagram accounts ()
9. Others (please mention if you use other E-

commerce systems

(.....
.....))

2. How did you hear about the e-commerce systems you used?

1. Form a friend () 2. Via social media ()
3. Via Email ()
4. Other (please mention how:.....)

3. You access the E-commerce systems:
 1. Using mobile phone () 2. Using personal computer ()
 3. Using desktop computer ()
 4. Other (specify:.....)
4. Do you prefer to use:
 1. E-commerce () 2. Traditional commerce()
5. You use e-commerce on a:
 1. Daily basis () 2. Weekly basis ()
 3. Monthly basis () 4. Few times in a year ()
 5. Never ()
6. Degree of concerned quality
 1. Very concerned () 2. Somewhat concerned ()
 3. Little concerned () 4. Not concerned ()
7. Do you have bank account?
 1. Yes () 2. No ()
8. Do you have electronic purse?
 1. Yes () 2. No ()

3. The obstacle that makes it hard for people to use E-commerce systems in Sudan.

#	The sentence	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Electronic literacy					
2	High cost of internet					
3	Lack of Electronic payment facilities for enabling transfer of funds					
4	Imperfect legal system and policy barriers					
5	Limited access of Telecommunication infrastructure					
6	Limited access to Personal Computers					
7	Lack of online culture					
8	American sanction					
9	insecurity					
10	Not trusting online shops					
11	Not trusting money transactions through internet					
12	Low internet speed					
13	Not verified online shops					
14	Lack of effective promotions					

4.Ways to encourage people to use E-commerce systems in Sudan.

#	Sentence	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	High internet speed					
2	Low internet prices					
3	Verified online shops					
4	Easy to use E-commerce systems					
5	Provide safe online payment method					
6	Provide more variety of product options					
7	Availability of delivery option					

**5. Ways to help spread concept of quality in Sudan
among E-commerce systems.**

#	Sentence	Strongly agree	agree	Neutral	disagree	Strongly disagree
1	Hire good specialist					
2	Encourage developers to Apply quality standers					
3	make sure standards being followed by evaluation					
4	Change developer's attitudes toward quality					
5	Customize quality models and make them easy to follow					
6	Encourage people to ask for systems with high quality by using rating features					
7	Using feedback feature					
8	Make the feedback periodic surveys seeking feedback					
9	Offer rewards for feedback, small discount, or promotional items					
10	Verify online shops that follow quality standards					

بسم الله الرحمن الرحيم

استبيان لتقييم استخدام أنظمة التجارة الإلكترونية في السودان

الإخوة والأخوات الأعزاء:

هذا الاستبيان هو أداة من أدوات جمع البيانات المستخدمة للحصول على درجة الماجستير بجامعة السودان للعلوم والتكنولوجيا (كلية علوم الحاسوب وتقنية المعلومات)، يهدف إلى جمع بيانات عن استخدام أنظمة التجارة الإلكترونية في السودان، لمعرفة الأنظمة الإلكترونية المستخدمة من قبل المواطنين السودانيين، ومستخدم من قبل من؟ وماهي الصعوبات والعوائق التي تقف في أوجه المواطنين السودانيين وتحد من استخدامهم لهذه الأنظمة؟ وماهي أهمية جودة هذه الأنظمة بالنسبة لهم؟ وكيف يمكن أن نشجعهم على أن يحصلوا على أنظمة إلكترونية ذات جودة عالية.

شكرا على حسن تعاونكم.

الباحثة:

سارة أحمد عبد الرحمن

١. معلومات عامة:

١. الجنس:

١. ذكر () ٢. أنثى ()

٢. العمر:

٣. المؤهل الأكاديمي:

١. لم أرتد المدرسة () ٢. مرحلة الأساس () ٣. مرحلة الثانوي () ٤. مرحلة جامعية () ٥. التعليم ما فوق الجامعي ()

٤. هل أنت:

١. طالب () ٢. موظف () ٣. غير موظف ()

٥. كم يبلغ مرتبك؟

١. ١٠٠ - ١٠٠٠ جنية سوداني () ٢. ١٠٠١ - ٢٥٠٠ جنية سوداني ()
٣. ٢٥٠١ - ٥٠٠٠ جنية سوداني () ٤. فوق ٥٠٠٠ جنية سوداني ()

٢. أنواع أنظمة التجارة الإلكترونية التي يتم استخدامها من قبل المواطنين في السودان , (تطبيقات على الهاتف المحمول, مواقع التواصل الاجتماعي و أنظمة أخرى):

١. خلال استخدامك لأنظمة التجارة الإلكترونية في السودان, ماهي الأنظمة التي قمت باستخدامها(بإمكانك اختيار عدة خيارات)؟

١. المحفظة الإلكترونية ()
٢. DigiAds ()
٣. سوق سو ()
٤. موقع لها وله ()
٥. دي- ريكوست ()
٦. سمارت ديلفري ()
٧. صفحات و مجموعات الفيس بوك ()
٨. حسابات الإنستقرام ()
٩. أخرى (فضلا إذا استخدمت أنظمة تجارة الكترونية اخرى اذكرها هنا
(.....))

٢. كيف تعرفت أو سمعت عن الأنظمة الإلكترونية التي قمت باستخدامها؟

١. من صديق () ٢. عن طريق مواقع التواصل الاجتماعي ()

٣. عن طريق البريد الإلكتروني () ٤. أخرى (تفضل بذكرها هنا
(.....))

٣. تقوم باستخدام أنظمة التجارة الإلكترونية عن طريق:

١. الهاتف المحمول () ٢. جهاز حاسوب محمول ()

٣. جهاز حاسوب مكتبي () ٤. أخرى(تفضل بذكرها هنا.....))

٤. هل تفضل أن تستخدم:

١. أنظمة تجارة الكترونية () ٢. أنظمة تجارة تقليدية ()

٥. معدل استخدامك لأنظمة التجارة الإلكترونية:

١. بصورة يومية () ٢. بصورة أسبوعية ()

٣. بصورة شهرية () ٤. عدة مرات في السنة () ٥. أبداً ()

٦. مدى أهمية جودة نظم التجارة الإلكترونية بالنسبة لك:

١. مهمة جدا () ٢. مهمة الى حد ما ()

٣. مهمة بصورة قليلة () ٤. ليست مهمة ()

٧. هل تمتلك حسابا بنكيًا الكترونياً؟

١. نعم () ٢. لا ()

٨. هل تمتلك محفظة إلكترونية؟

١. نعم () ٢. لا ()

٣. العقبات والصعوبات التي تحد من انتشار استخدام أنظمة التجارة الإلكترونية في السودان:

#	العبارة	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
١	الأمية الإلكترونية					
٢	تكلفة الانترنت العالية					
٣	عدم توفر طرق الدفع الإلكتروني لتسهيل عملية الدفع الإلكتروني					
٤	الأنظمة القانونية و الحواجز السياسية المنقوصة و الغير ملمة بأنظمة التجارة الإلكترونية					
٥	ضعف البنية التحتية للاتصالات					
٦	صعوبة الوصول لأجهزة الحاسوب و استخدامها					
٧	عدم انتشار ثقافة استخدام الانترنت (استخدامه في الترفيه فقط)					
٨	العقوبات الامريكية التقنية (الحظر التقني)					
٩	عدم الأمان و الثقة عند تصفح الانترنت					
١٠	عدم الثقة في المتاجر الإلكترونية					
١١	عدم الثقة في اجراء المعاملات المالية باستخدام الانترنت					
١٢	سرعة الانترنت البطيئة					
١٣	المتاجر الإلكترونية غير الموثقة من قبل الجهات المختصة					
١٤	عدم الترويج بصورة جيدة لأنظمة التجارة الإلكترونية					

٤. طرق لتشجيع المواطنين لاستخدام أنظمة التجارة الإلكترونية في السودان:

#	العبارة	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
١	انترنت ذو سرعة عالية					
٢	انترنت ذو تكلفة منخفضة					
٣	متاجر الكترونية موثقة من قبل الجهات المختصة					
٤	انظمة تجارة الكترونية سهلة الاستخدام					
٥	طرق دفع الكتروني آمنة					
٦	تقديم خيارات متنوعة من المنتجات في المتاجر الالكترونية					
٧	توفير خدمة توصيل المنتجات للمنازل					

٥. طرق لتشجيع انتشار مبدأ الجودة في السودان (أنظمة تجارة الكترونية ذات جودة عالية):

#	العبارة	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
١	توظيف مختصي جودة					
٢	تشجيع المطورين لتطبيق معايير الجودة (من قبل المؤسسات)					
٣	الحرص على اتباع معايير الجودة عن طريق التقييم المستمر من قبل المؤسسات					
٤	تغيير سلوك المطورين لمعرفة أهمية الجودة (عن طريق الدورات و ورش العمل)					
٥	تخصيص نماذج الجودة وجعلها سهلة التطبيق					
٦	تشجيع المستخدمين لطلب أنظمة ذات جودة عالية عن طريق ميزة التقييم من قبل المستخدمين					
٧	استخدام ميزة الإفادة أو التغذية العكسية (هي آراء المستخدمين تجاه أنظمة التجارة الإلكترونية)					
٨	جعل التغذية العكسية بصورة دورية للحصول على المعلومات بصورة دورية					
٩	عرض مكافآت للمستخدمين عند عمل تغذية عكسية					
١٠	توثيق المتاجر الإلكترونية التي تتبع معايير الجودة من قبل الجهات المختصة					