# Evaluating System Content's Quality in E-Learning System By Using the Analytical Hierarchy Process (AHP) Approach

[1]Asmaa Jameel Al_Nawaiseh, [2]Dr.Yehia Helmy, [3]Dr Emadeldin Khalil

*Abstract*

*This study identifies and analysis critical quality characterizes that should be considered to ensure successful development and implementation for the E-learning system in institutes, its System Content's Quality characterize with its sub characteristics and attributes.*

*The model has been empirically validated by fitting the model to data collected from 302 students engaged with an e-learning system in one of the Jordan universities through the pairwise comparison technique from all evaluated end users.*

*System Content Quality characteristic has three sub characteristics i.e. Student Oriented Domain, Online services and Content's Quality. Each sub characteristic has its attributes to determine the results of the evaluation. Analytical Hierarchy Process (AHP) had extensively been applied in a multi-criteria decision for making many practical decision-making problems the AHP model had been used to collect the pairwise comparison judgment from all evaluated end users.*

*Keywords: E-learning System, Contents' Quality, AHP, Priority, Pairwise Comparison.*

## I.    Introduction

In our published paper ( Al_Nawaiseh, Helmy, & Khalil, 2020), a new quality's model dedicated to Academic Information System (AIS), has been proposed and built to support a standard set of software quality characteristics.

Software Content as one of software quality aspects is very important to be considered in the E-Learning System, The evaluation is needed to determine the level of System Content software. In  ( Al_Nawaiseh, Helmy, & Khalil, 2020) the same new model has been further enhanced through identifying new attributes for the sub-characteristics in the model and defining metrics rules to measure the quality of these new attributes.

[1]Helwan University, Egypt

[2]Helwan University, Egypt

[3]National Telecom Regulatory Authority

The breakdown of the attributes along with their associated metrics and criteria. Also, several existing methods used for selecting E-Learning System components have been review, and their disadvantages have been outlined concerning the enhanced model. This paper discusses an evaluation of the characteristics of System Contents Quality on E-learning system using our proposed software quality model Elearning System Quality Evaluation (ESQE). System Content's quality that should be considered to ensure successful development and implementation for the E-learning system in institutes, its critical quality characterize. The content Quality characteristic has three sub characteristics i.e. Student Oriented Domain, Online services and Content's Quality Each sub characteristic has its attributes to determine the results of the evaluation. The enhanced model is tested with the support of AHP through an empirical study. In this research, the University of Jordan is considered to measure and evaluate the quality of the E-learning in its camps to assist system analysts, developers, and programmers in implementing their eLearning projects. Because of evaluates, the recommendations will be mention to both the development of the target system E-learning System, its maintenance; and last effects for the lifetime of the system.

The empirical study here follows the following strategy:

- For each of the quality attributes, an evaluation is made for an ELearning System in the sample study, and then the pairwise comparison judgment is determined.

- A questionnaire is developed and deployed for the characteristics, sub-characteristics and attributes to obtain appropriate weight values that represent the relationships between each pair of attributes.

## II. METHODOLOGY

### 2.1 E-Learning As Comprehensive Information System.

E-Learning systems allow faculty members to manage their courses electronically and to use technology tools in teaching and communicating with their students. The E-Learning system is a new suite of software tools that have been used in an educational setting for less than a decade.

Moreover, E-Learning enables instructors to extend the classroom beyond its traditional boundaries of time and space ( Al-Shboul & Rababah, 2013)The example of E-Learning proves that this system is a comprehensive system necessity of integrating all subsystems in universities as a platform mainly addresses education.

Now E-Learning systems include some administrative rules, as they are known from conventional software, like enrollment in a course. Yet, such a system is not capable to consider all the regulations and additional restrictions. Without connecting to administrative systems, the online-registration is not error-free and may result in manual corrections of the enrollment lists (Nagarajan, 2010). That causes a special need for interoperability that includes the support of numerous formats and the access of metadata. Besides describing the content of the course, the metadata are data about data in other administration systems for education. Therefore, there is a big potential for the re-use of teaching material in digital learning systems (Al-Fraihat, Joy, Masa'deh, & Sinclair, 2020).

### 2.2 Platform at the University of Jordan

Universities in different countries have responded to E-learning in their high institutes, differently according to the regulations, Regarding the University of Jordan, it adopted the blended learning approach as all universities in Jordan, which is a hybrid of traditional learning and online learning. Which means the students attend face-to-face lectures; at the same time, all learning materials are provided online for students besides the Electronic

Assessment or E-Exam. Moodle is used in the University of Jordan to design a well-formed E-learning platform and learning management system (LMS).

LMS users at the University of Jordan are classified into five categories according to their authorities: an editing-teacher, non-editing teacher, student administrator, creator, and guest where each one has different roles.



*Figure 1: The University of Jordan E-learning platform homepage.*

## III. Related Work

(Etaati, Sadi-Nezhad, & Makue, 2011) Evaluated some E-Learning System by considering ISO9126 attributes and of E-Learning success factors from other researches, before they build their new model they studying E-Learning literature. Their model consists of three main criteria Learning Community, System Content and Personalization of Wang model and twenty-nine sub-criteria, System content has the sub-attributes up-to-date, sufficient and useful content. (Wang, 2003) cited in (Etaati, Sadi-Nezhad, & Makue, 2011) contends that "specifying the domain of the construct, generating items that exhaust the domain, and subsequently purifying the resulting scale should create a measure which is content or face valid and reliable."

Besides, they evaluated their new quality model in three well-known Universities in Iran by using a standard AHP model for the selection of the most appropriate E-Learning system. All of these universities provided high standard E-Learning system for students and staff, the researcher has captured information by conducting interviews with students and staffs.

(Baklizi & Alghyaline, 2011) Publish a study about how to evaluate The E-Learning website of Jordanian Universities based on ISO/IEC 9126 standard, which uses six main characteristics: functionality, reliability, usability, efficiency, maintainability, portability, and its sub-characteristics. The results show that the average of quality in E-Leaning websites is 65.45 %. The results reflect the student's opinion about the website and might be used to improve the quality of E-Learning website for those universities. The respondents in this study were the students only; they do not have experience in educational software with academic information systems. If the academic staff with information developers participate also, the study will become more accurate. However (Yuhana, Rahardjo, & Rochimah, 2014) introduced a framework for measuring the quality of web-based AIS (Academic Information Systems) using visitors, developers and institutions perspectives approach. AIS quality instrument built from the combination of ISO/IEC 9126, ISO/IEC 25010:2011, WBA Quality Model, and COBIT. This framework was expected to produce a measurement of academic quality web-based information systems more accurately and provide detailed recommendations to produce a better system, especially to support the business processes of AIS but their paper is still a proposed conceptual model and has not yet done in experimental study or implemented in a real-world case study. Later the same authors Yuhana et.al (2015) made an experimental study to evaluate their proposed quality model which called the Academic Information System Quality Instrument (AISQI) which proposed in 2014. They study the characteristics of portability on Assessment Module of ITS's Academic Information System (SIAKAD ITS), using Academic Information System Quality Instrument (AISQI) which proposed by Yuhana et.al (2014) to assess the quality of academic information system as it mentions previously.

Another study conducted by (Almarabeh, Yousef, & Majdalawi, 2015) to find out the impact of E-Learning management system in the University of Jordan, they survey the students' acceptance for this new educational system and address the challenges facing the students while using the E-Learning management system. The university deploys the E-Learning framework, which was adopted from Khan's framework that consists of three portions, was presented after deploying it on the University of Jordan. Students face a number of problems when taking an E-Learning course and using (Moodle) platform in learning. The University of Jordan's students addressed some of these problems; such as lacking self-assurance and experience with the use of computers, lacking skills in commonly used applications, self-motivation, time-management, language problems, privacy, security, and resistance to change. This study discovered other problems facing students when using the E-Learning System in the University of Jordan related to the hardware resources, followed by defects in the university network.

This study focuses on the students only, not all the users of this academic system like instructors, developers, and technical employee.

(Paredes, 2016) conducted a study to evaluate the software quality characteristics of Academic Information System (AIS) on a mobile application using ISO 9126 criteria in terms of functionality, reliability, usability, efficiency, maintainability, and portability. The software quality characteristics of academic information system mobile application for using the ISO 9126 criteria was effective in terms of function.

They discover that the system's performance was not affected by the amount of resource utilization, and could continue to deliver its function under certain conditions.

This means that the respondents believed that the system could easily adapt to changes such as new specifications, operating environments or upgrade in system requirement without affecting its operation, we think

this attribute evaluates by IT experts, not for the parent or students. (Tabrizi, Tufekci, Gumus, & Cavus, 2017) Have carried out a study at their university to evaluate the usability characterizes which extract from ISO/IEC 9126: Understandability, Learnability, Operability, Attractiveness, and Compliance of the Near East University (NEU) Student Information System (SIS).

According to the authors, the result of this study will be helpful for the NEU SIS developer team when considering improvement possibilities for future versions of the system. The researchers have evaluated attributes, and then adjust the weight format accordingly for this evaluation, the evaluation team consisted of three developers, all the previously identified data attributes and system attributes are given to each evaluator to conduct their evaluation in a proper ISO/IEC 9126 format. After evaluating each metric separately, the study results revealed that understandability of the system achieved the optimum value. The learnability sub-characteristic results indicate that the system is sufficiently learnable, Operability as an important sub-characteristic of the system yielded an acceptable result, Attractiveness and usability compliance results were not perfect, which means that the attractiveness sub-characteristic reveals that the Einstein design team needs to focus on improving the interface design of the system.

( Uppal, Ali, & Gulliver, 2017) Propose an e-learning quality model (ELQ); consists of three dimensions:

 - Service dimension, comprising of five independent variables:

   Responsiveness, Reliability, Tangibility, Assurance and Empathy.

 - Information dimension, comprising of Learning Content.

 - System dimension comprising of Course Website.

We noted that in addition to service consideration of Information and system quality are essential to achieve the overall perception of quality for E-learning systems.

Multiple regression analysis is used to test the model; in addition, a Factors Analysis was conducted to investigate the reliability and validity of the measurement model.

The outcomes of data analysis show that "Assurance, Responsiveness, Tangibility, Course Website and Learning Content" have a positive correlation with the perception of ELQ model. E-Learning students prefer a stable and easy to use e-learning environment, yet do not perceive empathy and reliability as significant to student perception of ELQ.

According to (Gürkut & Nat, 2018) Student Information System (SIS) is one of the key systems for facilitating the management and development of Higher Education Institutions (HEI). Course advisors use the SIS to decide courses that the students will be based on their performance, students use SIS to make online course registration, to check their timetable, exam schedules, exam results and transcript.

SIS use for academic decision-making purposes as well as other information systems is crucial. The importance of their paper is to understand the impact of System Quality, Information Quality and Information Presentation on Student Information System satisfaction of academic and administrative staff. They declared that the System Quality is one of the measurements for the information processing system software and hardware. Sensitive measures such as ease of access, user-friendliness, system reliability and flexibility have been utilized in previously assessed survey instruments in order to obtain system quality measurement. The results show that System Quality has a positive effect on decision-making satisfaction and the Information Quality, which means information accuracy, completeness, relevance, content needs, and information timeliness, affect the overall satisfaction of the SIS users, therefore we build our model depending on these results. Previous research (Bharati & Chaudhury, 2004) cited in (Gürkut & Nat, 2018) show that Information Presentation which means image formats, colours and graphics in contrast to tables, Interfaces and incorrectly designed screens can badly affect users and cause unnecessary work in decision-making. (Al Adwan, 2018) Conduct PhD thesis about Development of E-Learning in the Higher Education Systems in Jordanian Universities, his study aimed to assess the abilities of full-time students and faculty members. The study sample included students and faculty members of the English department at two universities, it was conducted to investigate the technological factors that could influence the involvement of both sides in participating in E-Learning programs and explore their attitudes and readiness to integrate Information and Communication Technology (ICT) into their education. In conclusion, the results have shown that full-time faculty members and students in both universities are not yet to get involved in E-Learning programs; many issues must be addressed according to their technological readiness and their attitudes before implementing E-Learning programs.

## IV.    Research Objectives

The objectives that the research seeks to achieve are:

- Identify basic attributes and their sub-attributes for measuring software quality in E-Learning systems, and identifying relationships between them in preparation for comparison with each other, and to detect potential weaknesses, And how to address and overcome them.

- Study the integration of the basic and sub-factors of quality measurement in the applied information systems in the universities.

- Suggest solutions and recommendations avoid most of the gaps and constraints that affect the effectiveness of measurement Quality and success in the information systems applied in universities.

- Build a standard approach that measures and evaluates the quality of ELearning System, which mix several software quality standards, to assist system analysts, system developers, and system programmers in their projects.

- Build a standard approach that measures, evaluates and improve existing quality models.

- Save time and effort in selecting high-efficiency software to support the information

Systems within the high education sector.

## V.    Important of Research

All universities can benefit from this novel model to implement their ELearning system that meets all the qualities and conditions recommended in this research and becomes a measure of the efficiency of their systems, besides they will save their time and efforts in selecting high-efficiency software to support the Information Systems within their high education sector. Our novel model will reflect the image of the university externally, so the university's systems are the road map for the guest of the page whether he or she is a new student or the student's guardian. Another benefit, besides, Save time and effort in selecting high-efficiency software to support the Information Systems within the high education sector ( Al_Nawaiseh, Helmy, & Khalil, 2020).

## VI.    Instruments of Study

The empirical study has been executed on collecting the data by a questionnaire designed for all characteristics, sub-characteristics and attributes. This approach is supported by our model in ( Al_Nawaiseh, Helmy, & Khalil, 2020) and was found to be very useful in collecting data, starting from level 1 (characteristics), down to the level-2 (sub-characteristics), down to the level-3 (attributes) by giving the suitable weight.

The pairwise comparison judgments are made concerning the three levels of the hierarchy, expressed in tabular format herein in Table 2.

The respondents, who are comprised of students, staff from the University of Jordan field of study here, have received 380 questionnaires by E-mail or hand-by-hand papers, see the table below.

*Table 1: Response Rate for University of Jordan*

| | |
|---|---|
| Number of the questionnaire distributed | 380 |
| No response. | 40 |
| Returned questionnaire. | 340 |
| Incomplete questionnaire. | 38 |
| Number of the analyzed questionnaire | 302 |
| Response rate | 79% |

They have been asked to give a rate to each characteristic, sub-characteristic and attribute-based on Saaty's one to nine scales, see Table 6.2 Individual responses have been obtained and subsequently, all questionnaires have been compiled by taking the mean of all weight-values. The average is used to form the corresponding pairwise comparison judgment matrices for determining the normalized weights. This high response rate is due to the direct involvement of instructors in the distribution process, in this research the instructors received soft copy questionnaire to distribute on their students.

*Table 2: Scale of Relative Importance.*

| Intensity of Importance | Definition |
|---|---|
| 1 | Equal Importance |
| 3 | Moderate importance |
| 5 | Strong importance |
| 7 | Very strong importance |
| 9 | Extreme importance |
| 2,4,6,8 | For a compromise between the above values. |

## VII.    Structuring the Hierarchy

This section formulates the appropriate hierarchy with the assistance of the enhanced model ( Al_Nawaiseh, Helmy, & Khalil, 2020). The hierarchy is expressed in a tabular format reflecting the four levels (Level 0 to Level 3) shown in Table 6.1 Such organization makes it applicable to the AHP process.

The goal is to evaluate the Academic System (E-learning system) according to our new model that meets end-user requirements, herein the goal is placed at the top level of the hierarchy (Level-0), the main characteristic and namely system content's quality was identified to achieve our goal (Level 1). The sub-characteristics (Level 2) decomposed Level 1 features into System Oriented Domain, On-line Services and Content's Quality. The Attributes (Level 4) consist of eight attributes, as listed in Table 3 and grouped in several subsets, each corresponds to one of the three sub-characteristics.

*Table 3: new proposed model ESQE {Source ( Al_Nawaiseh, Helmy, & Khalil, 2020)}*

| Goal (Level-0) | Characteristics (Level-1) | Sub-characteristics (Level-2) | Attributes (Level-3) |
|---|---|---|---|

| Choosing The Best Academic System | Functionality | Interoperability | Platform-mpatibility Data mpatibility |
| | | Suitability | Application-main Function tification changes. |
| | | Compliance | Standardization |
| | | Security | Privacy Authentication |
| | Reliability | Recoverability | Time to recover. Error reporting. |
| | | Availability | Planned Down e |
| | | Maturity | Fault Tolerance Evolvability. |

| | Usability | Operability | Effort for rating Administrability |
| | | Understandability | Documentation Training User Support |
| | | Learnability | Time to Use Time-to-figure. |
| | | User Interface | Consistency Simplicity User control |
| | Efficiency | Time behaviour | Response Time Scalability |
| | | Resource aviour | Memory-zation. Disk utilization. |
| | Maintainability | Changeability | Customizability. Portability. |
| | | Testability | Self-test. Test Site. |

| | | Upgrading | Easy to upgrade |
|---|---|---|---|
| System Content's lity | | System oriented ıain | Content vancy<br><br>Student service rmation |
| | | On-line services | On-line ssment.<br><br>Ftp service.<br><br>Connectively. |
| | | Content quality | Up to date ent.<br><br>Content design.<br><br>Accessibility. |

In this study, we will analyze an important quality feature of the E-learning system, which is our contribution to our previous research. It is the quality of the content of the system and all its sub-characteristics, then evaluated by students and teachers through scientific methods to measure the degree of importance.

Other characteristics will be evaluated later, in other studies

**7.1 System Content's Quality**

To empower our model we added a new character, system content quality with four sub-character system domain, on-line services, and content quality with their attributes to measure this sub-character. "Content quality" relates to the quality of a system used to present and layout information and the presence of technical attributes that affect student perception of system platform with on-line service quality.

This new character with their new attributes added to ISO software quality model to evaluate the E-learning system as a target system of the Academic Information System.
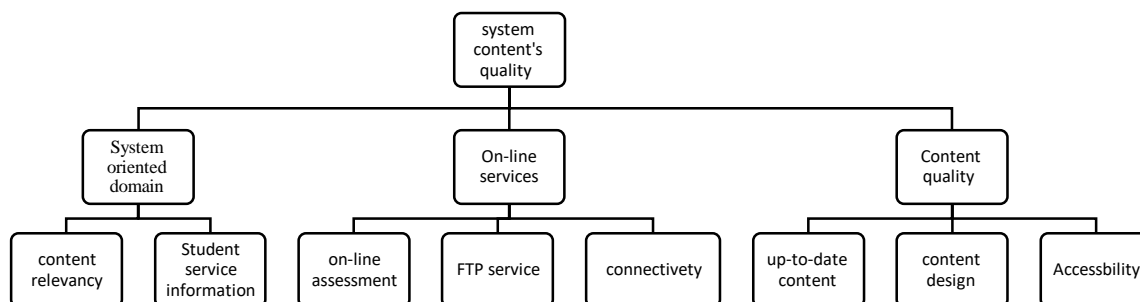


*Figure 2: System Content's Quality in ESQE*

The following are the sub characteristics of system content quality with their respective attributes were used as a contribution to this study.

**1. Student Oriented Domain:** Academic system services geared specifically to the student, to serve the students in their all-academic activities during their study years.

**- Content relevancy**: (Alkhattabi, Neagu, & Cullen, 2010) define accessibility character as the quality aspects concerned into accessing distributed information. Measure by sub-attributes relevancy, response time and availability they consider relevancy as sub-attributes of accessibility. In our model means, the system has a relevance content that enables the students or instructor to be informed correctly to their right information extracted from another system such as enrollment, academic degrees, and researches.

**- Student Services Information**: This means that the system provides students with academic and services information like, housing, healthcare, scholarships…etc., which means the system, integrates with other systems.

**2. On-Line Services:** Refers to any information and services provided over the Internet. This system provides on-line service, for instance, enrollment, grades, fees, web services such as FTP, newsgroup, chatting, assessment…etc.

**- On-Line Assessment**: The system has A grading service for E_Exams and assignments, which provide the grade immediately to students and instructors after finish attempt, the survey can be embedded in course contents by the instructor to get students opinions toward the course or anything the instructors need.

**- FTP Service:** end-users can sending and receiving files across the E-Learning system (download and upload) easily. Students are expected to download course materials from dedicated course web sites; access course-management systems, such as WebCT and Blackboard; and make presentations using PowerPoint (Uppal, Ali, & Gulliver, 2018).

**- Connectivity**: the students connect with the instructors easily with communication tools provide by the system forums, chat, and e-mail.

**3. Content Quality:** (Uppal, Ali, & Gulliver, 2018) introduce "Learning content" as information and "Course website" as system constructs. In the current work, "Learning content" refers to accessible and accurate learning material provided to students promptly as up to date content in our new model.

"Learning content" factors were taken from previous work, primarily (Alla & Faryadi, 2013) and (Hein, 2014), also declare the content of E-Learning system relevant to the learning objectives, succinct and design.

**- Up-to-Date Content**: This website is regularly updated in terms of the semester and course information to keep their academic material up-to-date.

**- Content design:** Significant factors impacting perceived content quality, were grouped and cited by (Etaati, Sadi-Nezhad, & Makue, 2011) as relating to interface design (Cho, Cheng, & Lai, 2009), navigation ( Volery & Lord, 2000), attractiveness ( Lin, 2010) and ease of use (Selim, 2007). Students can access class notes, handouts on course web sites without assistance, assuming the course web sites are design to be accessible, and the students have access to needed information and computer communication technologies, including adaptive software for screen reading and magnification. (Cidral, Oliveira, Di Felice, & Aparicio, 2018).

The content design in our model means the elements organize attractively and consistently, and the system provides the end-users with multimedia elements such as videos, presentations, and eBooks on the courses directly, without having to search the web for multimedia that relates to the content.

**- Accessibility:** (Alkhattabi, Neagu, & Cullen, 2010) proposed a new quality framework to measure the quality of the content provided by e-learning systems they define accessibility character as the quality aspects concerned into accessing distributed information, and measure by sub-attributes relevancy, response time and availability.

(Fichten & Barile, 2009) Defined the accessibility in E-learning system when the students have access to needed information and computer communication Technologies, including adaptive software for screen reading and magnification. Including PowerPoint presentations in class, web-based discussions to further In-class dialogue, access course-management systems, such as WebCT and Blackboard.

In this paper accessibility mean how the end-users and developers can easily access to their account on E-learning through many any Devices like pc, laptop, tablet and Mobile phone and they can access Website most of the time.

Then these new characters will be evaluated by pairwise comparison between criteria and alternatives using standards AHP approach.

### 7.2 Constructing the Weight Values Table for the Characteristics.

Using Saaty's scaling-table 6.2, the AHP six steps and the collected data from the questionnaire describe responder's answers average relative to the importance of characters to each other, so the mean of responders.

Appendix, a weight value is assigned for each of the characteristics as a mean value of responses: Functionality, Reliability, Usability, Efficiency, Maintainability, and system content.

The outcome was shown in Table-6.1, taking into account row-0 and column-0 presenting the headers. Thus, the weight and priority values are computed as follows:

- Value 4.21 is assigned to System Oriented Domain versus Online Services Thus, Online Service versus System Oriented Domain becomes 1/4.21, which means .238

- Value 9.11 is assigned to System Oriented Domain versus Content's quality Thus, content's quality versus System Oriented Domain becomes 1/9.11, which means .110.

- Value 5.000 is assigned to Online Services versus Content's quality Thus, content's quality versus Online Services becomes 1/5, which means .200

*Table 4: Weights Values for the Sub-Characteristics According to System Content's Quality.*

| System Content's Quality | System Oriented Domain | Online Services | Content's Quality |
|---|---|---|---|
| System Oriented Domain | 1.000 | 4.210 | 9.110 |
| Online Services | 0.238 | 1.000 | 5.000 |
| Content Quality | 0.110 | 0.200 | 1.000 |
| Sum | 1.347 | 5.410 | 15.110 |

This table describes responder's answers average relative to the importance of characters to each other.

To conduct the comparison Table of size N X N for n criteria, also called the priority Table, we must find the ranking of priorities, namely the Eigen Vector, by normalize the column entries by dividing each entry by the sum of the column entries, and then take the overall row average to get Priority Weight to see table below.

*Table 5: Pairwise Comparisons Judgment for the Sub-Characteristics According to System*

| System Content's Quality | Student Oriented Domain | Online Services | Content Quality | Priority Weight |
|---|---|---|---|---|
| Student Oriented Domain | 0.742 | 0.778 | 0.603 | 0.708 |
| Online Services | 0.176 | 0.185 | 0.331 | 0.231 |

| Content Quality | 0.081 | 0.037 | 0.066 | 0.062 |
|---|---|---|---|---|
| C.R= 0.074% | | | | $\sum$Priority Weight=1 |

## 7.3 Checking for Consistency

The next step is to calculate a Consistency Ratio (CR) to measure how consistent judgments have been relative to large samples of purely random judgments. To verify the consistency of the comparison Table, Saaty (1980) proposed a Consistency Index (CI) and Consistency Ratio (CR) and should satisfy the condition of CR <= 0.1

Where CR is the average of consistency index.

C.R=C.I / R.I where R.I is the Random Index whose value depends on N.

*Table 6: Random Consistency Index*

| N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| R.I | 0 | 0 | 0.52 | 0.88 | 1.11 | 1.25 | 1.35 | 1.40 | 1.45 | 1.49 |

Consistency Index (C.I) = $((\lambda)_{max} - N) / N-1$ where n is the compared elements. If the C.R is > 0.1 the judgments are untrustworthy because it is too close for comfort to randomness and the evaluation test is valueless must be repeated. Here the consistency ratio obtained by free web-based AHP solution, AHP priority calcula
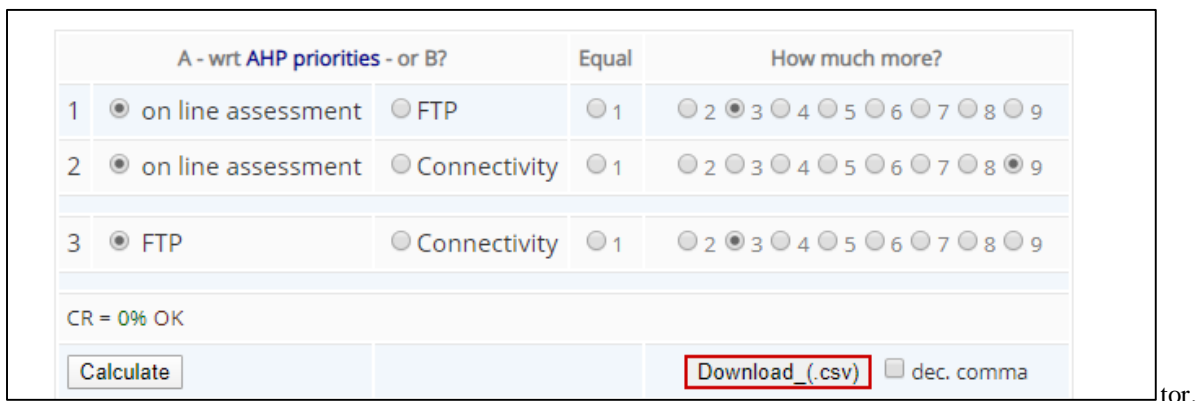

tor.

*Figure 3: AHP Priority Calculator*

## 7.4 Constructing the Weight Values Table for Sub-Characteristics and Attributes for System Content Quality Characterize.

The corresponding matrices for the sub-characteristics are constructed and shown below in Tables, following exactly the same procedures applied on the Characteristics, The reader may notice that character is compared to itself because it is single sub-characteristic; therefore, the assigned priority value is one.

*Table 7: Weights Values for the Attributes According to Student Oriented Domain.*

| Student Oriented Domain | Content evancy | Student Service rmation |
|---|---|---|
| Content Relevancy | 1.000 | 5.800 |
| Student Service Information | 0.172 | 1.000 |
| Sum | 1.172 | 6.800 |

*Table 8: Pairwise Comparisons Judgment for the Attributes According to Student Oriented Domain.*

| Student Oriented Domain | Content evancy | Student service rmation | Priority Weight |
|---|---|---|---|
| Content Relevancy | 0.853 | 0.853 | 0.853 |
| Student Service Information | 0.147 | 0.147 | 0.147 |
| C.R=0% | | | ∑Priority ght=1 |

*Table 9: Weights Values for the Attributes According to Online Services.*

| Online Services | Online essment | FTP ·ice | Connectivity |
|---|---|---|---|
| Online Assessment | 1 | 3.11 | 9 |
| FTP Service | 0.322 | 1 | 5 |
| Connectivity | 0.111 | 0.2 | 1 |
| Sum | 1.433 | 4.31 | 15 |

*Table 10: Pairwise Comparisons Judgment for the Attributes According to Online Services.*

| Online Services | Online essment | FTP ice | Connectivity | Priority Weight |
|---|---|---|---|---|
| Online Assessment | 0.698 | 0.722 | 0.6 | 0.673 |
| FTP service | 0.224 | 0.232 | 0.333 | 0.263 |
| Connectivity | 0.078 | 0.046 | 0.067 | 0.064 |
| C.R=0.03 | | | | ∑Priority ght=1 |

*Table 11: Weights Values for the Attributes According to Content Quality.*

| Content Quality | Up to Date | Content Design | Accessibility |
|---|---|---|---|
| Up to Date | 1.000 | 1.112 | 6.720 |
| Content design | 0.899 | 1.000 | 6.970 |
| Accessibility | 0.149 | 6.970 | 1.000 |
| Sum | 2.048 | 9.082 | 14.690 |

*Table 12: Pairwise Comparisons Judgment for the Attributes According to Content Quality.*

| Content Quality | Up to date | Content design | Accessibility | Priority Weight |
|---|---|---|---|---|
| Up to date | 0.488 | 0.122 | 0.457 | 0.356 |
| Content design | 0.439 | 0.11 | 0.474 | 0.341 |
| Accessibility | 0.073 | 0.767 | 0.068 | 0.303 |
| C.R=0% | | | | ∑Priority ght=1 |

*Table 13: priority weights for sub- Characteristics for the System Contents' Quality.*

| Characteristics (Level-1) | Local ght | Sub Characteristics (Level-2) | Local ght | Attributes (Level-3) | Loca eight |
|---|---|---|---|---|---|
| System Content lity | 0.032 | Student Oriented hain | 0.708 | Content evancy | 0.85 |
| | | | | Student Service rmation. | 0.14 |
| | | On-Line Services | 0.231 | On-Line essment. | 0.67 |
| | | | | Ftp Service. | 0.26 |
| | | | | Connectivity | 0.06 |
| | | Content Quality | 0.062 | Up to Date tent. | 0.35 |
| | | | | Content design. | 0.34 |
| | | | | Accessibility. | 0.30 |

## VIII. Results and Discussion

Table 13 presents all the calculations. It could be seen that, the eigenvector of relative importance or in the other words the weights of the sub characteristics as the

Following student-oriented domain (0.708), On-Line Services (0.231), Content Quality

(0.62).

Therefore, from students and academicians perspectives Student Oriented Domain of the E-learning system is the most important one in the other three Characteristics, followed by On-Line Services and Content Quality.

honestly, the results were expected because the Academic system services geared specifically to the student, to serve the students in their all-academic activities during their study years, so it must be oriented to the student and their instructors, this sub-character has the high eigenvectors or high priority weight, this services can be measure by their own attributes and their priority weights.

Content Relevance (0.853) and Student Service Information (0.147). It was clear from the evaluation of students and teachers of this feature

that it is necessary for their academic system providing them with their information in other systems such as registration information, grades, payment of fees and university housing, in respondents opinion it's more important than the other attribute the student information service and is the ability to access other systems to extract information.

From an educational perspective, the students consider the most vital aspects of an E-learning system is On-Line Assessment with priority weight (0.673), Ftp Service (0.263) and Connectivity (0.064). The results revealed that On-Line Assessment achieved the optimum value corresponds to students.

On-Line Assessment, What matters most to students and teachers in academic systems is the system of exams and scores. Therefore, systems developers must improve and develop these services, that is accurate and available to students that allow them to review their exam performance and to teachers improve their skills in assessing students fairly, secondly file transfer protocol FTP (0.263) it's a fetal service to students, they download course materials, upload Assignments, files, video and attach files to their teachers.

According to respondents connectivity(.064) less important feature than others maybe they can find many ways to connecting with their instructors face to face messenger and email not restrict with E-learning system. Many universities omit this character in their academic systems.

Finally, the last three attributes that up to date contents ( 0.356), content's design (0.341) and Accessibility (0.303), are associated to achieve the sub-characterize Content's quality. The most important one is up to date the contents of E-learning. Then E-learning system design, the team needs to focus on improving the design of the content of the system, considering the design of contents, like elements, organized in an attractive and consistent way, multimedia elements must be arranged in consistency manner.

The last attribute is easy to access to E-Learning through many devices PCs, Laptop, Tablet and Mobile phone, most academic systems and academic webs achieve this attribute.

AHP process has been applied to calculate eigenvectors and eigenvalue of sub-characteristics of quality characteristics of the target system. Therefore, this empirical study provides high institutes with the quality characteristics and their importance that should be taken into account in developing implementing their E-learning system. In which it can be assured that the E-learning systems will be successfully implemented.

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