

# Measuring Students' Perception of E-SERVQUAL at E-learning Institutions: Evidence from Egypt

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## Abstract

The rapid use of E-learning at the higher education institutions directed attention to focus on studying and measuring the students' perception of service quality using E-SERVQUAL model. Many challenges are facing E-learning especially in developing countries as it is a new experience for higher education.

The research objective is to measure students' perceived E-SERVQUAL at two Egyptian universities. We used and adapted the proposed instrument of Udo et al., 2011 which contains five major dimensions: empathy, responsiveness, assurance, reliability, and website contents. In addition, the measurement used to measure the quality of E-learning, and students' satisfaction and behavioral intentions.

Data analysis shows that all the E-SERVQUAL model dimensions are playing an important role in perceived quality and the students' responsiveness dimension is the most important one for student' perceived satisfaction. The proposed model is very significant in explaining the joint impact of E-SERVQUAL and students' satisfaction variables on assessing students' intention to enroll in online education in the future. Important recommendations proposed for managing institutions of higher education to increase the quality and sustainability of the e-learning context especially developing the communication process between students and lecturers to increase the students' perception of responsiveness.

**Key Words:** E-SERVQUAL, Quality of E-learning, students' Satisfaction, perception of E-learning quality, behavioral intention.

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## **1. Introduction and Research Problem:**

Recently, there is an increasing interest in higher education internationally to move towards E-learning to cover many gaps such as: students' locations, part timers, etc...). These movements using online classes created many challenges especially the service quality offered to students. Also, the E-learning education is very important for emerging countries to offer education services for a large group of students from different geographical areas and whom did not have chance to join the university for personal or social reasons.

Lately, many researchers developed the well-known SERVQUAL model to evaluate the students' perceptions of the quality of E-learning service. Based on the study of Udo et al. (2011) to modify the SERVEQUAL instrument to assess E-learning service quality, we adapted and used the measurement to examine students' perception of E-learning quality in two Egyptian Universities which introduced E-learning.

The current study focuses on three important concepts, E-SERVQUAL model dimensions as a measure of overall service quality of E-learning which consequently influences students' satisfaction and future behavioral intention to register in online education. This research comprises 5 sections; the first section is the introduction will be followed by literature review, section two. Section three will illustrate the research methodology and hypotheses. The fourth section will address the data analysis and hypotheses testing. Finally, section 5 will report findings and suggest future research.

## **2. Literature Review:**

The purpose of this section is to shed the light on the recent researches that addressed the E-learning quality and students' experience in the area of higher education. We are going to emphasis on the model of E-SERVQUAL as a measure for perceived quality of online service, students' satisfaction and their behavioral intention.

### **2.1. E-SERVQUAL**

The E-SERVQUAL model permits to examine the customers' satisfaction of online services and to detect any problem facing them while providing these services (Wolniak and Bozena, 2012).

A number of researchers have reported that E-SERVQUAL model is considered a good tool to assess the service quality at E-learning institutions (Arambewela & Hall, 2006; Rogotti & Pitt 1992; Foroughi et al., 2011; Chatterjee et al., 2009; Yeo & Li, 2013; Albu & Ivan, 2012).

Iacovidou et al., (2009) specified that higher education's quality is a set of dimensions while a number of researchers were assessing service quality in the context of higher education by using the dimensions of the E-SERVQUAL model, which proposes five dimensions, namely, responsiveness, assurance, tangibles, empathy and reliability as originally proposed by Parasuraman et al., (1988) as applied by (Soutar & McNeil, 1996; Pariseau and McDaniel, 1997; Cuthbert, 1996; Wong et al., 2012).

While several studies stated that E-SERVQUAL can be used as an effectual instrument for assessing behavioral intentions in many industries including restaurants and tourism (Cronin & Taylor, 1992; Carman, 1990; Parasuraman, et al., 1988; Olorunniwo et al., 2006; Cuthbert, 1996; Dabholkar, 1995).

Several attempts have been made to employ the E-SERVQUAL model in assessing the perceived learning quality from the point of view of the traditional students whilst Stodnick & Rogers (2008) were amongst the first for using E-SERVQUAL in this area and identified that empathy, reliability, and assurance were significant predictors, consequently, they determined that the E-SERVQUAL model can be used to measure the satisfaction of the students and their perception of instruction's quality.

The current research adopts the Udo et al., (2011) measure because this version of E-SERVQUAL is amended to reflect e-learning environment. In the same time, researchers

replaced “Tangibles” by “website content” to properly reveal the E-learning environment taking in consideration that the “Website Content” has been used in former researches (Santos, 2003; Cao, et al., 2005).

Udo & Marquis (2002) stated that website content is the demonstration of information and functions that portray the overall firm existence and its public image, which affect the customer perception of web service quality.

Websites are very significant instruments for delivering content and outreach for students and acting as central locations for accessing the institutions' information and resources. On the other hand, poor layouts or accessibility issues, making the institutions' resources more complex to locate which are resulting in losing effectiveness (Daniel, 2015).

The quality of the Website quality is the conformance to specified expectations of stakeholders (Bonnie & Dianne, 2016). There are some previous researches suggested that website can be evaluated through three steps which are verifying that the organization exists in the relevant domain, applying rational criteria to website evaluation, and pursuing reliable global measures of website quality (Olsina et al., 2000; Rocha, 2012).

Saha & Grover (2011) advocated that Website design has advanced across five sequential themes which are information/content, usability, interactivity (Web 2.0), mobility/integration and more recently the semantic intelligence promised by Web 3.0.

Online service quality including six dimensions while four of them are related to website content, these dimensions are pictures and graphics, accuracy of the content, aesthetics, and website substance (Sun, et al. 2008).

Wang (2003) indicated that there is a positive relation between effective website content and customers' attitude to the web-based services' quality that they take, which consequently leading to behavioral intentions to remain using the website's services. A research of Cao & Seydel (2005) stated that there are three critical factors which are availability of multimedia, web

content, and web design and layout affecting E-learning experience and the inclusive quality perception.

## ***2.2. Perceived Quality***

There have been a number of longitudinal researches involving quality that have stated that there is no sole definition of “quality” and the search for a worldwide definition of quality has generated contradictory results (Lee, et.al., 2013, Parasuraman, et al., 1985, 1988; Dabbagh, 2005).

Heterogeneity, inseparability, and intangibility of production and consumption are the three distinctive features for the quality of service (Parasuraman, et al. 1985). Subsequently the quality of service definition was linked to the perception of customer about quality which is defined as being “the customer’s overall evaluation of the standard of the service delivery process” (Hellier, et.al, 2003).

There is a mix of seven activities representing the definition of quality in the environment of higher education which are, alignment of activities, improving basic activities (research, teaching, and institution services), adopting innovation and leadership in all activities, resources and budget with the strategic plan, determining the customers’ needs, improving outcomes, capitalizing in developing human resources, data usage, information and knowledge for making decisions, and stakeholders and the market (Thair, et. al., 2006).

Perceived quality is considered a vital factor in marketing, and nowadays it is a factor of huge attention by both practitioners and researchers in services (Tsiotsou, 2005). A huge amount of literature has been published on higher education. These studies identified that students are the key stakeholder and consequently clarified the reason why the satisfaction of the student has become a very crucial issue for the institutions of higher education. (Mainardes, et.al., 2010; Odhiambo & Hii, 2012; Shanahan & Gerber, 2004).

Many researchers have reported that the application of e-learning can be expensive as a result of the relatively low adoption rate among users and this cost must be balanced through improving students' satisfaction. (Sawang, et.al, 2013;

Bacca, et.al, 2014). Quality can be considered a vital component of satisfaction whereas the students' perception reveals vital information in evaluating and expressing quality (Jackson & Helms, 2008). Quality is defined as the meeting or exceeding the expectations of customers. Accordingly, the main objective for applying quality is to achieve customers' satisfaction (Jackson & Helms, 2008).

Factors found to be influencing E-learning success has been explored in several studies (Wang et al., 2007; Roca & Gagne, 2008). There are three constructs affecting the success of E-learning and consequently affecting students' satisfaction; these factors are technical issues, inter-activity, and instructor variables (Wang et al., 2007; Martinez et al., 2007; Sherry, 1996).

### **2.3. Satisfaction**

Student's satisfaction is considered one of the five major dimensions of E-learning quality (Bolliger, et al., 2010). Previous studies have reported that student's satisfaction is the overall idea about E-learning system (Wang & Wang, 2009), and usually can be utilized in assessing student's attitudes (Wu, et al., 2010). This dimension, measures the interaction between the students and the system of E-learning (Rabaa'i, 2009).

Zhu (2012) stated that students' satisfaction should be taken in consideration once the E-learning is applied especially in the stage of evaluating the E-learning system effectiveness and specified that there is a positive relationship between the adoption of E-learning and the satisfaction level of the students with an E-learning context.

While many researchers have reported that students who are participating in E-learning have level of satisfaction with their learning method higher than students who are not joining the E-learning system (Alireza, et. al., 2012; Jung, et al., 2002).

### **2.4. Behavioral Intentions**

Behavioral intentions can be defined as the extent to which a person has formulated conscious plans to perform or not to perform some specified future behavior (Westerbeek & Shilbury, 2003). While, Parves & Ho (2014) stated that

behavioral intentions include positive and negative attitude and its representing students' willingness to behave and behavioral outcomes.

Many researchers reported that there are three dimensions shaping the behavioral intentions which are patronage intentions, complaining behavior, and worth of mouth (WOM) communications (Nor & Wan, 2016)

Zeithaml et al., (1996), stated that paying a price premium, or expressing cognitive loyalty to the organization, and talking positively and recommending the service to others representing favorable behavioral intentions and they identified that behavioral intention can be assessed through word of mouth, repurchase intentions, loyalty, price sensitivity, and complaining behavior.

Previous researches have reported that there is a relation between customer's experience and behavioral intentions, (Roca & Gagne, 2008; Lin & Hsieh, 2007; Burton, et.al, 2003). Consequently In the E-learning environment, we deduce that the higher the satisfaction of the E-learning experience, the higher the expectation of proceeding with the online courses.

### ***2.5. Relationships between Quality of e-Learning, Satisfaction, and Behavioral Intentions***

Godwin, et.al, (2012) stated that SERVQUAL and satisfaction are obviously different constructs, and the causal relationship of service quality and satisfaction and which construct better predicts behavioral intentions is not well defined in previous studies. A number of researchers advocate that satisfaction is an antecedent to service quality whereas other researchers support an opposite point of view which says that there is a positive relationship between perceived service quality and satisfaction, and consequently resulted in favorable behavioral intentions (Brady & Robertson, 2001).

While another point of view preserves that no obvious relations exist between the quality of service and satisfaction (Taylor & Cronin, 1994).

There is no basic rule for the relation between satisfaction and service quality, it depends on the customer's orientation which means that if the customer is cognitive oriented, this means that service quality leads to satisfaction whereas if the customer is affective oriented, this means that satisfaction leads to service quality (Dabholkar, 1995). No matter what is the causal ordering of the two constructs, some previous studies have reported that both satisfaction and service quality have direct relation to behavioral intentions (Kao et al., 2009; Mang & Lioa, 2007; Lin & Hsieh, 2007; Cronin et al., 2000).

Study of Brady and Robertson (2001) advocates that the E-learning quality leads to satisfaction across diverse cultures. While Godwin, et.al., (2012) stated that the direct relationship between E-learning quality and behavioral intentions may not be as important as the indirect effect through customer satisfaction based on the concept that the level of interaction between student and instructor is very low in the E-learning environment, proposing that direct relationship between the quality E-learning service and behavioral intentions may not be as important as the indirect impact through students' satisfaction.

### **3. Research Methodology and Hypotheses:**

#### ***3.1. Survey Instrument and Measurement:***

We developed an e-mail questionnaire to test the relationships among service quality dimensions, students' perceptions about e-learning quality, students' satisfaction and their intention to proceed with the online classes. Researchers adopted and used the model proposed by Udo et al., (2011) which composes of five dimensions which are empathy, assurance, website content, responsiveness, and reliability. The survey instrument is based on 5-point Likert scale where (5) denotes for strongly agree to (1) which denotes for strongly disagree.

In addition to services quality five dimensions, the questionnaire includes 4 items to measure the students' perceptions of E-learning quality, four indicators to measure satisfaction, and three items to measure behavioral intentions.



The demographic characteristics are measured by: age, education, gender and year of study.

### **3.2. Sample and data collection**

We collected data through online survey for undergraduate students who are enrolled in the E-learning programs at two Egyptian universities; Arab Open University (AOU), Cairo Branch, and Egyptian E-learning University (EELU). Potential participants were randomly selected and addressed via e-mails.

A total of 357 students shared the survey; 263 students from AOU (73.7%) and 94 students from EELU (26.3%). Data cleaning of suspicious response patterns (i.e., straight lining) reduced the sample size to 319 observations; 234 students from AOU (73.4) and 85 students from EELU (26.6%).

The demographic characteristics of the sample can be described as follows: the majority of students were male (74.9%). Also, 49.2% of students were enrolled in business programs, while 30.4% and 20.4% in computer and language programs, respectively. In addition, 48.6% of students were in the second year of study, while 9.4%, 23.2%, and 18.8% in the first, third, and fourth year of study, respectively. All age ranges are well represented.

### **3.3. Research Hypotheses:**

**The current research will test the following hypotheses:**

**H1: The relationship between service quality dimensions and students' perceptions of E-learning quality.**

H<sub>1a</sub>: Assurance positively affects students' perceptions of E-learning quality.

H<sub>1b</sub>: Empathy positively affects students' perceptions of E-learning quality.

H<sub>1c</sub>: Responsiveness positively affects students' perceptions of E-learning quality.

H<sub>1d</sub>: Reliability positively affects students' perceptions of E-learning quality.

H<sub>1e</sub>: Website content positively affects students' perceptions of E-learning quality.

**H2: The relationship between dimensions of service quality and students' satisfaction with E-learning experience.**

H<sub>2a</sub>: Assurance positively affects students' satisfaction.

H<sub>2b</sub>: Empathy is positively affects students' satisfaction.

H<sub>2c</sub>: Responsiveness positively affects students' satisfaction.

H<sub>2d</sub>: Reliability positively affects students' satisfaction.

H<sub>2e</sub>: Website content, in an E-learning environment, positively affects students' satisfaction.

**H3: The relationship between students' perceptions of e-learning quality and their satisfaction with E-learning experience.**

**H4: The relationship between students' satisfaction with E-learning experience and their intention to proceed with the online classes.**

**H5: The relationship between students' perceptions of E-learning quality and their intention to continue with the online classes.**

**H6: The Interrelationships among service quality dimensions, perceived E-learning quality and online students' satisfaction.**

H<sub>6a</sub>: Perceived E-learning quality plays a mediating role between "Assurance" and online students' satisfaction

H<sub>6b</sub>: Perceived E-learning quality plays a mediating role between "Empathy" and online students' satisfaction

H<sub>6c</sub>: Perceived E-learning quality plays a mediating role between “Responsiveness” and online students’ satisfaction

H<sub>6d</sub>: Perceived E-learning quality plays a mediating role between “Reliability” and online students’ satisfaction

H<sub>6e</sub>: Perceived E-learning quality plays a mediating role between “Website content” and online students’ satisfaction

**H7: The Interrelationships among the quality of E-learning, satisfaction of online students and their behavioral intentions:**

According to the research hypotheses, the following figure shows the proposed research model.

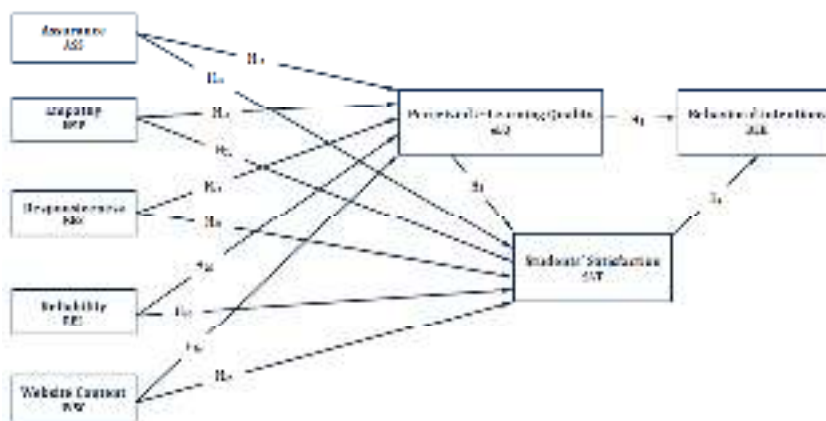


Figure1: Proposed Research Model

**3.4. Statistical method**

We used the partial least squares structural equation modeling PLS-SEM for testing the hypotheses, and to estimate the path model using the statistical software application Smart PLS 2.0 (Ringle et al., 2005).

## 4. Data analysis and results:

### 4.1. Descriptive statistics

The following Table shows the means, standard deviations and correlations among all variables under study. It is very clear that service quality dimensions (i.e., assurance, empathy, responsiveness, reliability, and website content) and perceived E-learning quality as well as the satisfaction of online students and their behavioral intentions are all on the average value, with small standard deviations.

Moreover, following the rule of thumb (Cohen, 1988), we have identified strong positive relationships between all dimensions of service quality and each of the perceived E-learning quality and students' satisfaction. We have also noticed a strong positive relationship between perceived quality of E-learning and students' satisfaction ( $r > .49$ ). Additionally, each of the perceived quality of E-learning and students' satisfaction has a moderate positive relationship with students' behavioral intentions ( $.49 \geq r \geq .30$ ). All correlations are significant at  $p < .001$ .

**Table 1: Descriptive statistics and correlation matrix of constructs**

Constructs	Mean	Std. Dev.	ASS	EMP	RES	REL	WSC	eLQ	SAT	BEH
ASS	3.39	0.88	1							
EMP	3.35	0.87	.616**	1						
RES	3.40	0.91	.629**	.702**	1					
REL	3.44	0.86	.554**	.581**	.630**	1				
WSC	3.32	0.79	.564**	.605**	.694**	.564**	1			
eLQ	3.37	0.80	.701**	.719**	.765**	.662**	.749**	1		
SAT	3.26	0.87	.697**	.712**	.770**	.663**	.676**	.811**	1	
BEH	3.03	0.92	.388**	.415**	.453**	.310**	.461**	.484**	.489**	1

\*\*Correlation were significant at  $p < .001$  (2-tailed).

### 4.2. Assessment of Measurement Model

The following Table presents the results of the measurement model. These findings support the internal consistency reliability of all the measures as the composite reliability (CR) is larger than .70 for all constructs (Nunnally & Bernstein, 1994). The results also indicate that all outer loadings

are above the threshold value of .708. The average variance extracted (AVE) for all variables are larger than the generally accepted value of .50.

The findings also provided a direct evidence of convergent validity of the constructs incorporated in the model (Hair et al., 2014). Moreover, one element (SAT1) has been dropped from students' satisfaction dimension due to having an outer loading below the accepted value of .708, and deletion of this item increased the compound reliability and the average variance extracted of its respective construct (Hair et al., 2011).

**Table 2: PLS results for the measurement model**

Constructs	CR	AVE
<i>ASS Assurance</i>	.91	.70
<i>EMP Empathy</i>	.89	.66
<i>RES Responsiveness</i>	.89	.73
<i>REL Reliability</i>	.92	.78
<i>WSC Website content</i>	.92	.60
<i>eLQ e-learning quality perceptions</i>	.91	.71
<i>SAT Students' satisfaction</i>	.87	.68
<i>BHE Behavioral intentions</i>	.91	.77

CR stands for composite reliability; AVE stands for average variance extracted.

Also, according to the criterion of Fornell-Larcker (1981), the findings indicate that all constructs square roots of the AVE are higher than the correlations of these constructs with other latent variables in the path model. These findings also support the discriminate validity of the constructs.

#### 4.3. Assessment of the Structural Model

Reliable and valid measurement model permits an assessment of the structural model estimates. Following the systematic approach to assess the structural model (Hair et al., 2014; Henseler et al., 2009), first, we assessed collinearity among the predictor constructs through running three separate ordinary least squares OLS regressions for each part of the model using IBM SPSS V.22 Statistical Package for Social Science and request collinearity diagnostics. The results show that all variance inflation factor values VIF are clearly less than the threshold of 5.

Therefore, collinearity amongst the predictor constructs is not an issue in the structural model (Hair et al., 2011). The following

Figure shows the considered structural model, the standardized path coefficients estimates, the R<sup>2</sup> values of the endogenous latent variables; perceived E-learning quality (eLQ), students' satisfaction (SAT), and behavioral intentions (BEH).

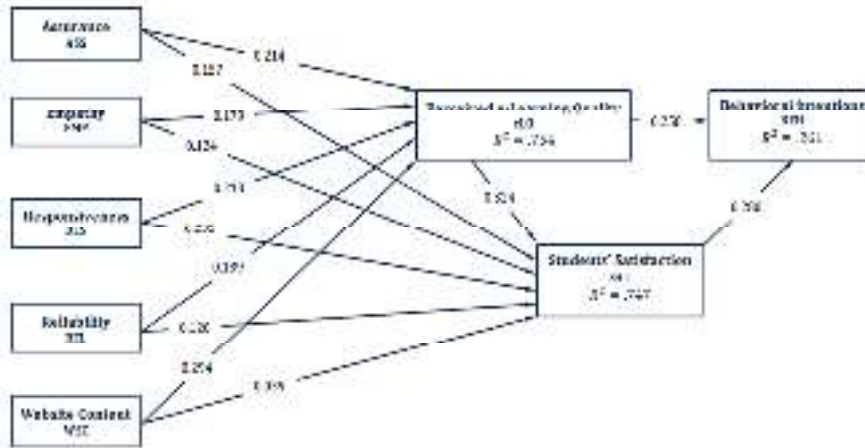


Figure 2: Structural model with path coefficients

Furthermore, the following Table presents PLS results for structural model and summarizes the results of hypotheses testing.

Table 3: PLS results for structural model

Path	Path coefficient	t value	p-value	Significance level	R <sup>2</sup>	Q <sup>2</sup>	Hypothesis
ASS → eLQ	.214	4.077	.000	***	.754	.534	H <sub>1a</sub> : Supported
EMP → eLQ	.179	3.420	.001	***			H <sub>1b</sub> : Supported
RES → eLQ	.213	2.552	.011	**			H <sub>1c</sub> : Supported
REL → eLQ	.139	2.276	.024	**			H <sub>1d</sub> : Supported
WSC → eLQ	.294	4.862	.000	***			H <sub>1e</sub> : Supported
ASS → SAT	.157	2.948	.003	***	.747	.512	H <sub>2a</sub> : Supported
EMP → SAT	.124	2.541	.012	**			H <sub>2b</sub> : Supported
RES → SAT	.233	3.511	.001	***			H <sub>2c</sub> : Supported
REL → SAT	.120	2.202	.028	**			H <sub>2d</sub> : Supported
WSC → SAT	.039	.776	.439	NS			H <sub>2e</sub> : Rejected
eLQ → SAT	.324	5.097	.000	***		H <sub>3</sub> : Supported	
SAT → BEH	.280	3.423	.001	***	.261	.188	H <sub>4</sub> : Supported
eLQ → BEH	.258	3.380	.001	***			H <sub>5</sub> : Supported

\*\* p < .05. \*\*\* p < .01

NS=stands for not significant

The central criterion for the structural model assessment is the coefficient of determination  $R^2$ . Perceived E-learning quality (eLQ), students' satisfaction (SAT), and behavioral intentions (BEH) with  $R^2$  values of .754, .747, and .261 respectively, enhance the model's predictive accuracy because they exceed the recommended value of .10 (Falk & Miller, 1992). Following the rules of thumb (Chin, 1998), the  $R^2$  values of eLQ and SAT can be considered substantial, whereas the  $R^2$  value of BEH is rather moderate.

In order to assess the extent of the  $R^2$  values as an evidence for predictive accuracy, the  $Q^2$  criterion of Stone-Geisser has been determined through blindfolding procedure to estimate cross-validated redundancy (Henseler et al., 2009). The  $Q^2$  values of eLQ (.534) and SAT (.512), as well as BEH (.188) are all above the threshold value of zero, thus supporting the model's predictive relevance with regard to the endogenous latent variables.

A significance testing of the structural model path coefficients has been done by carrying out the bootstrapping procedure with 5000 subsamples (Henseler et al., 2009). Regarding the first hypothesis (H1), the findings indicated that all service quality dimensions, in an E-learning context, significantly and positively influence students' perceptions of E-learning quality. Specifically, 'Website content' exerts the strongest positive influence on perceived E-learning quality (path coefficient=.294,  $t=4.862$ ,  $p < .001$ ), which supports (H1e). This is followed by 'Assurance' (path coefficient=.214,  $t=4.077$ ,  $p < .001$ ), which supports (H1a), then 'Responsiveness' (path coefficient=.213,  $t=2.552$ ,  $p < .05$ ), which supports (H1c). 'Empathy' (path coefficient=.179) and 'Reliability' (path coefficient=.139) exhibit lower path coefficients, with  $t$  values of 3.420 and 2.276 respectively, and significance level at  $p < .01$  and  $p < .05$  respectively, which supports (H1b) and (H1d). Therefore, these findings totally support hypothesis 1 (H1).

Also, the results indicate that all service quality dimensions, in the E-learning environment, except 'Website content', have significant and positive effects on students'

satisfaction with E-learning experience. Specifically, 'Responsiveness' has the strongest positive effect on students' satisfaction (path coefficient=.233,  $t=3.511$ ,  $p <.01$ ), which supports (H2c).

This is followed by 'Assurance', 'Empathy', and 'Reliability' which exhibit noticeably lower path coefficients (.157, .124, and .120 respectively), with  $t$  values and significance level at 2.948;  $p <.001$ , 2.541;  $p <.05$ , and 2.202;  $p <.05$  respectively, which supports (H2a), (H2b) and (H2d). Although the 'Website content' had the strongest positive effect on perceived E-learning quality, surprisingly, the results show that the relationship between this dimension and students' satisfaction is not significant leading to reject (H2e). Therefore, these findings partially support hypothesis2 (H2).

Moreover, regarding to hypothesis 3 (H3), the results show that perceptions of students about quality of E-learning significantly and positively affects their satisfaction with E-learning experience (path coefficient=.324,  $t=5.097$ ,  $p <.001$ ). This result supports (H3). Also, students' satisfaction with E-learning experience significantly and positively predicts their intention to proceed with the online classes (path coefficient=.280,  $t=3.423$ ,  $p <.01$ ). This result supports (H4). Finally, students' perceptions of E-learning quality significantly and positively affects their intention to proceed with the online classes (path coefficient=.258,  $t=3.380$ ,  $p <.01$ ). This result supports (H5).

In order to examine the total effects we evaluated how strongly each of the five constructs (Empathy, Reliability, Assurance, Responsiveness, and Website content) ultimately influences the key target variable 'Behavioral intentions' via the mediating constructs 'Perceived E-learning quality', and 'Students' satisfaction'.

Table 4 shows the corresponding results for the total effects of the exogenous constructs ASS, EMP, RES, REL, and WSC on the key target construct BEH.



**Table 4: Significance testing results of the total effects**

Path	Total effect	t value	p-value	Significance level
ASS → BEH	.119	4.303	.000	***
EMP → BEH	.097	4.317	.000	***
RES → BEH	.139	3.450	.001	***
REL → BEH	.082	3.611	.000	***
WSC → BEH	.113	4.006	.000	***

\*\*\*  $p < .01$

We can clearly observe from table 4 that among the five driver constructs or dimensions, 'Responsiveness' has the strongest total effect on students' behavioral intentions (.139), followed by 'Assurance' (.119), 'Website content' (.113), 'Empathy' (.097), and 'Reliability' (.082). All the e-LQ dimensions total effects are significant at  $p < .01$ . Therefore, it is advisable for universities to focus on management activities that positively influence the students' perception of instructors' online responsiveness.

Finally, by examining the size effect  $f^2$  and the relative effect of latent variables on predictive relevance (here:  $q^2$ ), the results confirmed the key role of website content in students' perceptions of E-learning quality ( $f^2=.161$ ,  $q^2=.062$ ), and in accordance with the rules of thumb for the  $f^2$  and  $q^2$ , these effect sizes can be considered medium and small respectively (Cohen, 1988; Henseler et al., 2009). Also, perceived E-learning quality plays the most important role in students' satisfaction ( $f^2=.095$ ,  $q^2=.032$ ), and the later ultimately has a highest relative impact and predictive relevance on the intention of students to proceed with the online classes ( $f^2=.280$ ,  $q^2=.041$ ).

#### **4.4. Importance-performance matrix analysis (IPMA) of path modeling results**

The importance-performance matrix analysis extends the findings of the basic PLS-SEM outcomes using the latent variable scores. For the students' behavioral intentions (BEH) as a key target construct in our analysis, IPMA contrasts the

structural model total effects (importance) and the index values of the latent variable scores (performance) to highlight significant areas for the improvement of management activities. More specifically, to enhance the intention of students to proceed with the online classes in the future, lines of relatively high importance and low performance (i.e., a high total effect) should be taken into consideration.

Calculating index values is implemented through rescaling latent variable scores to range between zero and 100 (Höck et al., 2010; Hair et al., 2014). The following Table presents the Index values and total effects for the IPMA of students' behavioral intentions (BEH).

**Table 5: Index values and total effects for the IPMA of behavioral intentions (BEH)**

Constructs	Importance (Total Effects)	Performance (Index Values)
ASS	.12	59.62
EMP	.10	58.89
RES	.14	60.12
REL	.08	61.05
WSC	.11	57.94
eLQ	.35	59.17
SAT	.28	56.50

Based on results in Figure 3, it is clearly apparent that the factor 'students' perceptions of E-learning quality' is highly relevant for enhancing their behavioral intentions because of its major importance. Although this area is already of a high index value (performance), there is a relative potential for more improvement. More effort has to be exerted to maintain the performance level of this area, or even expanding it by means of improving the universities' website content as it is the major factor affecting perceived E-learning quality. Also, universities should focus on management activities that enhance instructors' online responsiveness as it has strongest positive effect on students' satisfaction and ultimately influences students' intention to continue with the online classes.

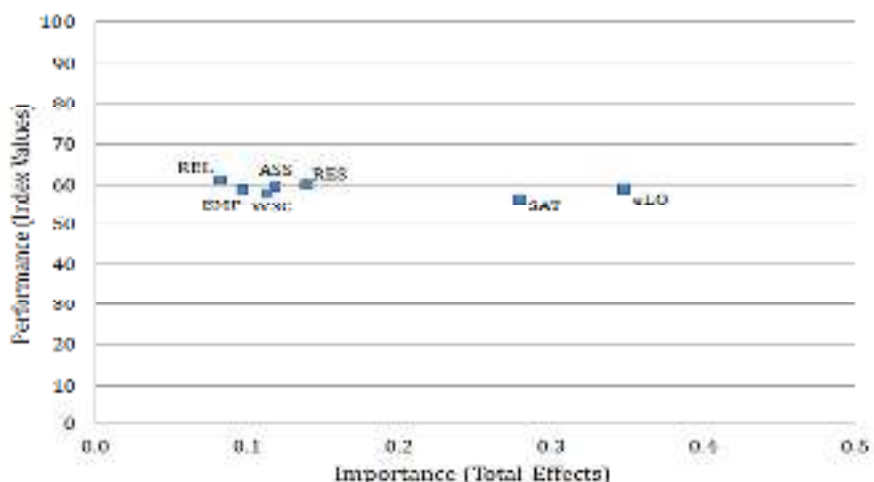


Figure 3: IPMA Representation of BEH

4.5. *Mediation test*

In this section, we focus on testing whether the relationships between service quality dimensions (i.e., assurance, empathy, responsiveness, reliability, and website content) and students' satisfaction and finally the relationship between perceived E-learning quality and their behavioral intentions are mediated by perceived E-learning quality (eLQ) and students' satisfaction (SAT) respectively, following Preacher and Hayes' approach (2004) instead of Sobel (1982) test, which faced some criticisms (Hair et al., 2014). In the first step, the PLS path model has been estimated without the potential mediator variables eLQ and SAT. Table 6 shows these path coefficients' significance, which results from conducting the bootstrapping procedure with 5000 subsamples.

**Table 6: Significance analysis of path coefficients without the potential mediator variables**

Path	Path coefficient	<i>t</i> value	<i>p</i> -value	Significance level
Without the potential mediator variable (eLQ)				
ASS → SAT	.227	4.008	.000	***
EMP → SAT	.182	3.738	.000	***
RES → SAT	.302	4.316	.000	***
REL → SAT	.167	3.306	.001	***
WSC → SAT	.135	2.680	.008	***
Without the potential mediator variable (SAT)				
eLQ → BEH	.481	11.753	.000	***

\*\*\*  $p < .01$

The relationships between all service quality dimensions (i.e., ASS, EMP, RES, REL, and WSC) and students' satisfaction (SAT) and finally the relationship between perceived E-learning quality (eLQ) and students' behavioral intentions (BEH) are significant at  $p < .01$ , thus, the mediators may absorb some of these effects or the entire effects. In the second step, the mediator variables have been included. The assessment focused on analyzing whether the indirect effects of all service quality dimensions, via the eLQ mediator variable, on SAT, as well as the indirect effect of eLQ, via the SAT mediator variable, on BEH are significant. A necessary (but not sufficient) condition is the significance of the relationships between all service quality dimensions and eLQ, as well as between eLQ and SAT, and also between SAT and BEH. These were confirmed by the evaluation of the structural model results (see table 3).

Based on results in the following table, which presents the significance analysis of indirect effects that obtained by carrying out the bootstrapping procedure with 5000 subsamples, it is clear that all indirect effects are significant at  $p < .01$  or at  $p < .05$ . Therefore, we have concluded that eLQ mediates the relationship between all service quality dimensions and SAT, and the later mediates the relationship between eLQ and

BEH. The only exception is the insignificant indirect effect of REL on SAT via eLQ. Thus, we have concluded that eLQ does not mediate the relationship between REL and SAT. This finding leads to reject (H6d).

**Table 7: Significance analysis of indirect effects**

Path			Indirect effect	t value	p-value	Significance level
Indirect effect via the eLQ potential mediator variable						
ASS	→	SAT via eLQ	.069	3.048	.002	***
EMP	→	SAT via eLQ	.058	2.692	.007	***
RES	→	SAT via eLQ	.069	2.486	.013	**
REL	→	SAT via eLQ	.045	1.945	.053	NS
WSC	→	SAT via eLQ	.095	3.461	.001	***
Indirect effect via the SAT potential mediator variable						
eLQ	→	BEH via SAT	.091	2.886	.004	***

\*\*  $p < .05$ . \*\*\*  $p < .01$

NS stands for not significant.

At final step, we assessed the strength of these mediations using the Variance Accounted For (VAF) as shown in table 8. Following *Hair et al., (2014)* rule of thumb, we have concluded that 30.6% of ASS's effect on SAT is explained via the eLQ mediator. This finding supports (H<sub>6a</sub>). Also 31.9% of EMP's effect on SAT is explained via the eLQ mediator. This result supports (H<sub>6b</sub>). Additionally, 22.9% of RES's effect on SAT is explained via the eLQ mediator. This fact supports (H<sub>6c</sub>). Moreover, 70.7% of WSC's effect on SAT is explained via the eLQ mediator. This result supports (H<sub>6e</sub>) and provides an explanation for the insignificant effect of website content' dimension on students' satisfaction as the eLQ mediator has absorbed some of this effect. Finally, 26.0% of eLQ's effect on BEH is explained via the SAT mediator. This result supports

(H<sub>7</sub>). Since the VAFs are all greater than 20% but less than 80%, these situations can be described as partial mediation.

**Table 8: Mediation effect size**

Path	Direct effect	Indirect effect	Total effect	VAF	Decision	Hypothesis
Mediation effect size for eLQ						
ASS → SAT via eLQ	.157	.069	.227	30.6%	Partial mediation	H <sub>6a</sub> : Supported
EMP → SAT via eLQ	.124	.058	.182	31.9%	Partial mediation	H <sub>6b</sub> : Supported
RES → SAT via eLQ	.233	.069	.302	22.9%	Partial mediation	H <sub>6c</sub> : Supported
REL → SAT via eLQ	The indirect effect is not significant				No mediation	H <sub>6d</sub> : Rejected
WSC → SAT via eLQ	.039	.095	.135	70.7%	Partial mediation	H <sub>6e</sub> : Supported
Mediation effect size for SAT						
eLQ → BEH via SAT	.258	.091	.348	26.0%	Partial mediation	H <sub>7</sub> : Supported

VAF stands for variance accounted for (i.e., the size of the indirect effect in relation to the total effect).

### 5. Concluding Remarks:

The objective of our research was to measure and assess the relationship between students' perception of E-SERVQUAL, their satisfaction and their behavioral intention to proceed to participate in online programs at higher education. In addition, we tested the validity of applying the Udo et. al., (2011) measure of E-SERVQUAL in education as the methods of teaching and offering education services changed substantially.

The developed structural model is very significant in measuring and explaining the overall E-learning quality. All the E-SERVQUAL dimensions have significant positive relationship with E-learning overall quality and satisfaction. Meanwhile, 'Website content' exerts the strongest positive

effect on perceived quality of E-learning in spite the fact that this dimension is not significant with students' satisfaction.

The "Responsiveness" dimension has the strongest positive effect on students' satisfaction. Thus, the responsiveness dimension is more important than the website contents to achieve satisfaction in spite the fact that the website content is more important to achieve E-learning quality.

Student perception of E-learning quality significantly and positively influences their satisfaction. Both, students' satisfaction and E-learning quality, within E-learning experience, are significantly associated and positively explains the intention of students to proceed with the online classes. Also, the analysis showed that responsiveness dimension has the strongest total effect on students' behavioral intentions.

Higher education institutions management should focus on activities that positively influence the students' perception of instructors' online responsiveness.

Students' satisfaction of E-learning has the highest relative impact and predictive relevance on students' intention to continue with online classes.

Finally, as for the significant analysis of indirect impact that obtained by carrying out boot-strapping procedure, it is clear that all the relationship between all services quality dimensions and satisfaction and the later mediates the relationship between the quality of E-learning and the behavioral intention of students to proceed with the online classes.

## **6. Limitations and Future Researches**

The research findings are obtained from E-Learning institutions of Cairo, therefore other researches should be applied in other parts of the country to increase the external validity of the research's results. The research was applied on bachelor degree students only, future research might apply on master and PhD students.

The E-SERVQUAL model used and adapted in the current research could be stretched to explore the relationship

between service quality and customer satisfaction and customer behavior intentions in all educational stages.

Perceived E-Learning quality in the higher education context should be taken in consideration from the point of view of other stakeholders' such as administrative staff, academic staff, etc. In addition, a comparative study should be conducted to explore the E-learning service quality gap between public and private higher educational institutions.

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