




Proposed enhanced gap analysis model for information systems sector (ISSERVQUAL)



Authors:

Raghda Taha¹ 
 Khaled Abdallah¹ 
 Yasmin Adel² 

Affiliations:

¹Department of Supply Chain Management, College of International Transport and Logistics, Arab Academy for Science, Technology, and Maritime Transport, Alexandria, Egypt

²Department of Mechanical Engineering, Faculty of Engineering, Université Française d'Égypte, Cairo, Egypt

Corresponding author:

Khaled Abdallah,
 khaled.seif@aast.edu

Dates:

Received: 23 Mar. 2024
 Accepted: 18 Sept. 2024
 Published: 21 Oct. 2024

How to cite this article:

Taha, R., Abdallah, K. & Adel, Y., 2024, 'Proposed enhanced gap analysis model for information systems sector (ISSERVQUAL)', *Acta Commercii* 24(1), a1270.
<https://doi.org/10.4102/ac.v24i1.1270>

Copyright:

© 2024. The Authors.
 Licensee: AOSIS. This work is licensed under the Creative Commons Attribution License.

Read online:



Scan this QR code with your smart phone or mobile device to read online.

Orientation: Gap analysis in the information system (IS) sector is difficult to assess.

Research purpose: A gap analysis model based on SERVQUAL is proposed to assess the gaps in IS services.

Motivation for the study: During coronavirus disease 2019 (COVID-19), there has been an extensive use of distant learning and virtual meeting applications. Yet, there is no well-documented way to evaluate the IS service provided.

Research design, approach and method: The proposed model adds a performance dimension covering the main characteristics of IS services. The model is tested on the internet service providers in Egypt as a case study. A questionnaire for the proposed model is developed, validated and distributed.

Main findings: The questionnaire is statistically analysed to find whether there is statistical difference between the expectation and the perception for each factor. Then the data are tested to find whether the gender of the respondents, internet service provider and the status of whether the respondent pays for the service themselves have a significant effect on the gap scores or not. Finally, an ordinal regression fit is introduced to estimate the overall satisfaction of the customers based on their gap score.

Practical/managerial implications: Despite SERVQUAL being an adequate tool to analyse the gaps for different services, it needs some adaptation to fit different services. One important drawback of SERVQUAL analysis for the IS sector is that the dimensions of SERVQUAL do not fully cover the customer expectations in the IS sector.

Contribution/value-add: This paper attempts to fill this gap in the literature by introducing the 'ISSERVQUAL' model.

Keywords: gap analysis; service quality; SERVQUAL; ANOVA; regression.

Introduction

There are many definitions for quality proposed over the years, and there is no one universally agreed upon definition. This is especially valid for service providers. Because of the vagueness and subjective nature of service quality, service quality has always been a big debate in the literature. According to Goetsch and Davis (2013), the different meanings of quality have essential common elements that can be extracted. These characteristics include meeting or exceeding consumer expectations; they are characterised by continual change and apply to individuals, systems, programmes, goods and environments. Owing to a lack of consensus in both identifying and assessing service quality, the definition has sparked a lot of interest and discussion in the literature (Wisniewski 2001).

With the advances of information systems, almost any product nowadays relies on some sort of information system. Examples of such applications include mobile devices, smart homes, ... etc. with new technologies becoming available and affordable every day such as Internet of Things to regular people. With these advances, the internet traffic has reached an unprecedented level (Cisco 2019). This brings attention to the quality of information systems with all the difficulties and challenges posed in service industries.

There are three major elements of information systems: products, processes and services. The measure of information system quality develops from products to processes and finally to services (Tan, Xie & Li 2003).

Because of coronavirus disease 2019 (COVID-19) precautions worldwide, a lot of businesses shifted most of their operation online. This put a significant stress on the international web, especially for learning purposes such as university lectures and school sessions. It is not uncommon nowadays to find all family members utilising the full bandwidth of their home broadband connection simultaneously. The rapid growth in the use of the internet and online learning using a variety of technologies has reinforced education as one of the most rapidly growing fields during the COVID-19 pandemic (Fahrurrozi et al. 2020). The circumstances of COVID-19 worldwide have brought a deeper sense of the importance of the quality of the internet service provided by the Internet Service Providers (ISPs).

Service quality is a broad concept that includes providing the services and the outcomes after that (Ahmed et al. 2017). The most used tool to analyse the performance of a service industry is the SERVQUAL model proposed by Parasuraman, Zeithaml and Berry (1985). SERVQUAL is a tool used to measure the difference between customer's expectations and customer's perceptions, and it is also known as the Gap Analysis Model (Caruana, Ewing & Ramaseshan 2000; Gajewska & Piskrzyńska 2016; Untaru, Ispas & Dan 2015). The model identified 10 aspects of service quality (Reliability; Responsiveness; Competence; Access; Courtesy; Communication; Credibility; Security; Understanding/knowing the customer and Tangibles) and later classified them into five dimensions (assurance, responsiveness, reliability, empathy and tangibles) (Oakland 2014). These revealed five gaps: knowledge gaps, design gaps, performance gaps, communication gaps and total gaps (Brown 2000).

SERVQUAL has been used in the literature in several service industries such as hotels as in Stefano et al. (2015); education as in Oldfield and Baron (2000); banks as in Newman (2001), Untaru et al. (2015) and Ahmed et al. (2017); health care as in Wong (2002) and Jonkisz, Karniej and Krasowska (2021); freight forwarding as in Huang, Bulut & Duru (2019), IT service desks as in Da Silva and Lins de Vasconcelos (2020) and many other industries. Yusefi et al. (2022) studied the effect of the responsiveness dimension on services quality from the viewpoints of the older adults hospitalised during COVID-19 pandemic

There have been many attempts to use SERVQUAL variants on information systems. The effect of outsourcing to information systems providers on the information service quality is the focus of Grover, Cheon and Teng (1996). Wang, Xie and Goh (1999) investigated some of the aspects of the consistency of Internet search engines. Parasuraman, Zeithaml and Malhotra (2005) suggested a structure for e-SERVQUAL consumers' perceptions and define the quality dimensions in e-SERVQUAL. Sullivan and Walstrom (2001) utilised SERVQUAL to measure the service quality of e-commerce websites comparing conventional and e-commerce businesses. Liu et al. (2015) developed an adjusted SERVQUAL model based on the Fuzzy Set Theory

to investigate quality in certification and assessment industry in China. Boakye, Natesan and Prybutok (2020) tried to assess the quality of cloud-based service platforms by applying confirmatory factor analysis on the gap scores surveyed from the customers. Jiang et al. (2001) included other sets of questions to analyse client satisfaction and service performance. User satisfaction includes knowledge, service and relation, and information product, while service performance included information system staff commitment, work quality and job skills. It should be noted that the questionnaire became very long and made the statistical analysis difficult to interpret. Rahmat et al. (2021) used SERVQUAL in assessing the academic information system of a private university.

There has been some criticism for SERVQUAL despite being widely used in different industries. Buttle (1996) reviewed some of the criticism. Park, Yi and Lee (2021) claimed that the dimensions of SERVQUAL are not stable, and that there is no need to stick to the five dimensions of SERVQUAL. Souca (2011) argued that SERVQUAL assesses customer satisfaction rather than finding the service gap. SERVQUAL tries to make participants recall their expectations before the experience with the company, which usually gets affected by the experience itself or by memory recalling issues. Another criticism is that SERVQUAL may be drifting towards ideal expectation rather than customer's expectation. Cronin and Taylor (1994) claimed that the gap measures are looking for perfection instead of assessing the goal performance. The length of SERVQUAL questions is also a frequently criticised aspect from participants. And another criticism that supports this research is that SERVQUAL does not always reflect on the five factors of the model, they are sometimes reflected in more or fewer factors. Gerhard, Christo and Deon (1997) and Niedrich et al. (2005) raised doubts about the dimensionality of SERVQUAL. Lee et al. (2022) studied the effect of word of mouth on the SERVQUAL scale and concluded that the results of the assurance and reliability could overcome the word of mouth.

However, as the service industry is multi-dimensional, SERVQUAL has proven a reliable tool for measuring service quality (Parasuraman 1994; Parasuraman et al. 2005).

Despite the fact that SERVQUAL is an adequate tool to analyse the gap in different service industries, it sometimes needs some adaptation to better fit different services. Li, Tan and Xie (2002) and Tan et al. (2003) had to modify the SERVQUAL by introducing attributes and dimensions to better suit the context of the web-based services. Gorla and Somers (2014) highlighted the importance of being able to measure service systems, its operations and effectiveness, especially the tangible part. However, one important drawback of SERVQUAL analysis for the information system sector is that the five dimensions of SERVQUAL do not fully cover the customer expectations. This is

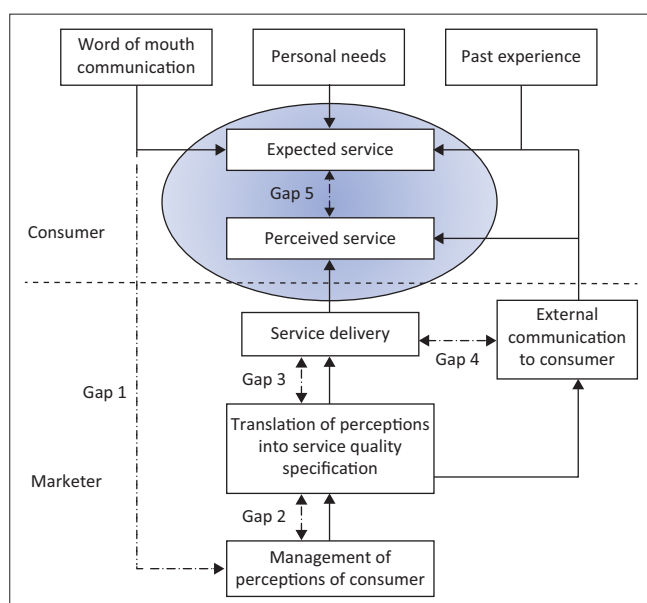
especially true when the customers have expectations of the performance of the delivered product. Hence, this paper is proposing a new model ISSERVQUAL as an extension to the SERVQUAL model by including another dimension, which is the 'Performance' dimension. The proposed model is then applied on the ISPs in Egypt as an applied case.

The rest of the paper is organised as follows. Methodology is discussed in Section 2. In Section 3, an extended discussion of the observation and their analysis is discussed. Finally, in Section 4, the conclusion of the study is presented.

Methodology

In this research, the SERVQUAL model is used to propose a general variation that is valid for information system providers, called here ISSERVQUAL. Figure 1 shows the gaps originally proposed by Parasuraman, Zeithaml and Berry (1985). It includes five gaps. Gap 1 represents the knowledge gap, gap 2 represents the standards gap, gap 3 represents the delivery gap, gap 4 represents the communications gap and gap 5 represents the gap between perceptions and expectations of the clients for the service provided.

The initial 10 dimensions that were proposed to represent service quality were later reduced to the five dimensions used in SERVQUAL models these days (reliability, assurance, tangibles, empathy and responsiveness). However, these dimensions do not entirely cover the characteristics of the information system sector. It is noted that the performance of the information system product is not included in the five dimensions.



Source: Parasuraman, A., Zeithaml, V. & Berry, L., 1985, 'A conceptual model of service quality and its implications for future research', *Journal of Marketing* 49(4), 44. <https://doi.org/10.2307/1251430>

FIGURE 1: The gap analysis model with the gap that is not entirely covered in the original SERVQUAL dimensions.

The proposed ISSERVQUAL assumes that customer satisfaction of the information systems is based on the five factors in SERVQUAL in addition to a new dimension that is proposed in ISSERVQUAL. The added dimension is the performance of the information system, which is intangible. The proposed added dimension is a result of the fifth gap in the original model that measures the difference between the expected service and the perceived service. This gap covers the five dimensions discussed further in the text but lacks the performance part of the information system product. The five dimensions in SERVQUAL are tangibles, reliability, responsiveness, assurance and empathy. Tangible represents the physical part of the service such as manuals, branches and equipment. Reliability represents the extent to which the customer believes the company is trustful. Responsiveness refers to the speed of the company in satisfying the customer's needs. Assurance represents the ability of the company to radiate confidence in their service. And empathy represents the humanitarian touch within the service.

Performance dimension

The contents of the performance dimension are initially proposed. Then several rounds of brainstorming sessions are conducted with experts from the information system sector to finally agree on eight factors. The proposed ISSERVQUAL model is shown in Figure 2.

Performance factors in our model are represented by features, price, consistency, drop rate, usage limit, customer service, technical support and value. It is defined as follows:

- *Features* represent whether the main aim of the information system product is aligned with the customers required features.
- *Price* represents how justifiable the customers think the cost of service to be.
- *Consistency* represents the stability of the service. Consistency may be thought of as a measure of variation from the targeted performance level.
- *Drop rate* represents the breakdown of the information system product.
- *Usage limit* represents the extent to which the information system product is allowed to work without imposed restrictions. Imposed restrictions include capacity limitation and/or traffic limitation as examples.

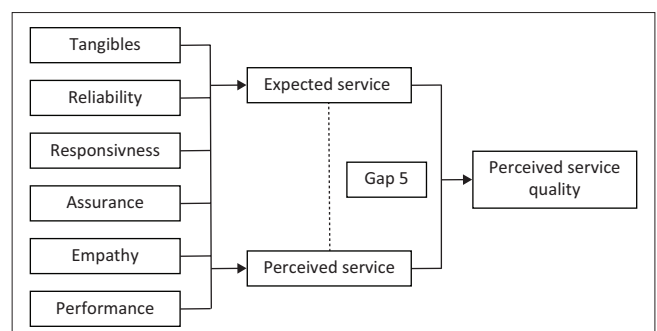


FIGURE 2: The proposed ISSERVQUAL model.

- *Customer service* represents support presented to customers for non-technical issues such as billing and administrative requests.
- *Technical support* represents the services provided to the customer for technical issues such as installation troubleshooting.
- *Value* represents the customers' appreciation of the price in relation to what they receive from the service.

Test design

SERVQUAL questions in addition to another eight proposed questions are presented to the respondents two times with different structure and format in each time. Initially, the questions collect the customers' expectations of the different dimensions with answers on the 5-point Likert scale. Then the same questions are asked again with regard to the customers' perceived quality service from the company.

The questionnaire now consists of five questions about reliability, four questions about assurance, four questions about tangibles, five questions about empathy, four questions about responsiveness and eight questions about performance. These questions are introduced to the customers two times.

In order to apply the proposed ISSERVQUAL model, the ISPs in Egypt are put into test as a case study. There are several reasons for choosing this as the case study. The use of the internet has increased significantly with the switch of most business to online operation amid the COVID-19 pandemic. Almost all houses had to switch the schoolwork and business into online sessions during the lock down and the quarantine periods. Another reason is the ever-growing reliance on streaming services worldwide and especially locally in Egypt with WatchIT becoming the main streaming service in Egypt beside other international services such as Shahid and Netflix. There are four ISPs in Egypt: WE, Orange, Vodafone and Etisalat.

A pilot study of 23 samples was first conducted by handing the survey to scholars and selected participants, some with high technical skills and some with basic technical skills. The questionnaire is revised according to the received feedback and modified accordingly. The modified version is distributed again, and the statistical analysis is performed on this small scale to test it before another final round is conducted at large.

Analysis and discussion

The questionnaire is prepared using Microsoft Forms online and distributed electronically to more than 500 people. A total of 150 people responded to the questionnaire amounting to 30%. The data were checked for reliability and the results in Table 1 show that the answers are adequately reliable for the analysis.

Out of the respondents, there are 62.67% subscribers with 'WE', 22% subscribers with 'Vodafone', 10% subscribers

with 'Orange' and 5.33% subscribers with 'Etisalat'. They are also divided into 59.33% males and 40.67% females. A total of 84% of the respondents are responsible for paying the bill by themselves, and 16% are users of the service who are not responsible for paying the bill themselves. These are shown in Table 2 (a, b and c, respectively).

It is required to test whether there is a significant difference between the customer expectation (E) and what the customer received, felt and perceived (P). This is carried out by conducting paired *t*-tests for all the questions between the perception answers and the expected answers (P-E). The statistical analysis is carried out using IBM SPSS. This involves using a null hypothesis, H_0 , so that the mean expectation score is equal to the mean perception for each question, and an alternative hypothesis, H_1 , so that the mean expectation score is different from the mean perception for each question. At 95% confidence, we reject H_0 for all questions. Hence, it can be concluded that there is a significant difference between what the customers are expecting and what the customers are receiving. This is common in services where the customer is always looking for more than what is actually delivered to him.

To further analyse the difference between the perception values and the expected values known as 'Gap Scores' and represented by (P-E), they are analysed by factor analysis to reduce the number of factors from the questionnaire without statistically affecting the significance of data. Factor analysis here focuses on explaining the variation among the data.

The principal component analysis (PCA) technique is utilised in this research. It starts with computing KMO and Bartlett's test to measure the sample adequacy. The sample adequacy

TABLE 1: Reliability analysis results.

Variable	Omega	Cronbach's alpha
Tangible	0.781	0.756
Reliability	0.747	0.780
Responsiveness	0.787	0.712
Assurance	0.719	0.713
Empathy	0.798	0.791
Performance	0.820	0.814
Total	0.942	0.940

TABLE 2: Distribution of the general information of responders.

Variable	Frequency	Percentage
Information systems programming		
Vodafone	33	22.00
Etisalat	8	5.33
Orange	15	10.00
WE	94	62.67
Gender		
Male	89	59.33
Female	61	40.67
Responsible party for payments		
Pay bill self	126	84.00
Someone else pays the bill	24	16.00

ISP, in systems programming.

for the data is equal to 0.90. This value is good for the test at 95% confidence as values close to 1 mean that the data would benefit from a factor analysis. The factors are first extracted, from which, a preliminary decision on the number of factors can be concluded. The result of the extraction from interpreting the scree plot is that the data can be extracted tentatively into five factors.

To make an appropriate decision about the number of factors, factor rotation via Promax is conducted so that the factors are interpreted easily. Table 3 suggests that the factors are as follows:

Factor 1: Reliability of service provider in doing things right, in keeping promises, in tracking requests and in fixing problems.

Factor 2: Performance of the service provider in terms of speed, price, speed variability, disconnection rate, quota and value. It should be noted that customer service performance is not considered and technical service performance is considered by the customers as parts of Factor 3.

Factor 3: This factor combines several aspects that are considered related by the customers. It consists of the assurance of the company and the company's employees that they are capable of providing adequate service, the responsiveness of the service, besides the technical support performance.

Factor 4: Empathy when dealing with customers and customers' requests. It is generally considered as whether the customers think the company cares for them or not. Customers think of the second assurance question as empathy (i.e. privacy of the data that flow through the company and the personal data it stores).

Factor 5: Tangible part of the service including branches, equipment etc.

TABLE 3: Pattern matrix using Promax.

Question	Component				
	1	2	3	4	5
RL2	0.94	-	-	-	-
RL4	0.91	-	-	-	-
RL1	0.829	-	-	-	-
RL3	0.756	-	-	-	-
RL5	0.65	-	-	-	-
P2	-	0.877	-	-	-
P3	-	0.786	-	-	-
P1	-	0.747	-	-	-
P5	-	0.738	-	-	-
P4	-	0.672	-	-	-
P8	-	0.567	-	-	-
A3	-	-	0.879	-	-
RE2	-	-	0.545	-	-
A4	-	-	0.543	-	-
RE4	-	-	0.537	-	-
A1	-	-	0.491	-	-
P7	-	-	0.432	-	-
E2	-	-	-	0.953	-
A2	-	-	-	0.668	-
E1	-	-	-	0.642	-
E5	-	-	-	0.578	-
E4	-	-	-	0.454	-
T2	-	-	-	-	0.946
T3	-	-	-	-	0.838
T4	-	-	-	-	0.589
T1	-	-	-	-	0.482

Firstly, the reliability of the responses is analysed. Secondly, the traditional Cronbach's alpha leading to 0.930 is used, which is good value for this study.

The data are used to analyse two things: Gap analysis and the effect of different groups on the overall satisfaction of the customer. Section 3.1 focuses on the gap analysis and Section 3.2 focuses on the analysis of the effect of different factors on customer satisfaction.

Gap analysis

In this section, one-way analysis of variance (ANOVA) is used extensively. The main idea of this section is to find whether the different factors have the same means across different factors. We want to find the effect of: (1) internet companies, (2) responsibility for paying the bill and (3) gender on the mean score gaps (P-E).

To find the effect of the different companies on the customers' gap scores, one-way ANOVA is used with factors computed for gap scores (P-E) as the dependent variable and the internet company that the customer is using as the independent variable.

The first step in this analysis is to check the homogeneity of the variance. If the test is significant, then there is a statistical significance that the means are not equal, and hence, robust test of equality of mean based on Welch is used rather than one-way ANOVA. Table 4 shows that we fail to reject the null hypothesis of the test of homogeneity of variance at 95% confidence. Table 5 shows the results of one-way ANOVA. At 95% confidence, the test is significant for Factor 1. We can reject the fact that Factor 1 has the same mean across the different ISPs while we fail to reject the fact that the other factors have the same mean across different companies.

This significant difference can be related to either higher customer expectations or lower customer perception. To find the reasons behind this difference, multiple

TABLE 4: Tests of homogeneity of variances.

Variable	Sig.
Factor 1	0.411
Factor 2	0.824
Factor 3	0.293
Factor 4	0.067
Factor 5	0.540

Sig., statistical significance.

TABLE 5: One-way ANOVA for the effect of the Internet Service Provider.

Variable	Sig.
Factor score 1	0.004
Factor score 2	0.097
Factor score 3	0.059
Factor score 4	0.140
Factor score 5	0.065

Sig., statistical significance.

comparisons for the means of each of the expectation and perception questions related to Factor 1 are conducted as shown in Table 6. For Factor 1, there is a significance at 95% confidence that the perceptions of Factor 1 (i.e. reliability) for the first question for Etisalat's customers are generally less than perception for Vodafone and Orange.

The second gap analysis is used to study the relationship between the effect of responsibility for paying for the service and the gap scores. As the test of homogeneity of variance is not significant, one-way ANOVA can be used. Table 7 shows that Factor 3 is significant at 95% confidence. The means for the two groups (those who are responsible for paying for the service and those who are just users and not responsible for paying for the service) are compared by conducting independent *t*-test at 95% confidence (as shown in Table 8.). It is observed that the perceptions of one of the assurance questions is significantly different between those who pay for the service and the others who do not pay for it. It can be concluded that Factor 3 (assurance and responsiveness) is significant and that, for the first assurance question, the perception of those responsible for paying the bill is less than those who are just users and not responsible for paying for the service themselves.

The third gap analysis is used to study the effect of gender on gap scores. The results show that at 95% confidence, there is no significant difference between the two genders in their gap scores. It is also noted that at 90% confidence, Factor 4 becomes mildly significantly different. The means for the two groups are compared by conducting independent *t*-tests at 90% confidence as shown in Table 9. It can be concluded that males have more expectations than females in two of the empathy questions.

TABLE 6: Multiple comparisons of means for Factor 1 for different Internet Service Provider companies.

Dependent variable	95% confidence interval	
	Lower bound	Upper bound
Factor 1 P_RL1	-1.51	-0.23
Etisalat Vodafone	-1.51	-0.23
Etisalat Orange	-2.69	-0.05

TABLE 7: One-way ANOVA for the effect of paying for the service.

Variable	Sig.
Factor 1	0.159
Factor 2	0.164
Factor 3	0.010
Factor 4	0.543
Factor 5	0.299

Sig., statistical significance.

TABLE 8: Independent *t*-test for Factor 3 between paying for the service and not paying for the service.

Factor 3 P_A_1	95% Confidence Interval of the Difference	
	Lower	Upper
Equal variances assumed	-1.129	-0.480
Equal variances not assumed	-1.018	-0.159

Analysis of the effect of different factors on customer satisfaction

For this section, the proposed ISSERVQUAL model adds a question about the overall customer satisfaction of the customer's ISP. These data are fitted using ordinal regression. The idea is to use the result of the questionnaire to predict the satisfaction level. For this analysis, the overall satisfaction is the dependent variable, and the different factors are the covariate independent variables. This model helps the Egyptian ISPs to predict their overall satisfaction from the customers' replies to the proposed ISSERVQUAL model, and it also gives the relative importance of different factors in improving the overall satisfaction.

Cauchit link function is used because of the presence of extreme values. The model fitting is significant at 95% confidence. The goodness of fit suggests a good fit as shown in Table 10. R^2 for the model amounts to 0.549 as shown in Table 11, and we fail to reject the null hypothesis that the location parameters are the same across response categories as shown in Table 12.

TABLE 9: Independent *t*-test for Factor 4 between the different genders.

Variables	90% Confidence Interval of the Difference	
	Lower	Upper
Factor 4		
E_E_2		
Equal variances assumed	0.096	0.691
Equal variances not assumed	-0.081	0.706
Factor 4		
E_E_4		
Equal variances assumed	0.008	0.443
Equal variances not assumed	0.002	0.450

TABLE 10: Goodness of fit.

Method	Sig.
Pearson	0.878
Deviance	1.000

Sig., statistical significance.

TABLE 11: Pseudo *R*-square.

Method	Sig.
Cox and Snell	0.549
Nagelkerke	0.575
McFadden	0.257

Sig., statistical significance.

TABLE 12: Test of parallel lines.

Model	-2 Log Likelihood	Chi Square	df	Sig.
Null Hypothesis	345.074	-	-	-
General	325.327	19.747	15	0.182

Sig., statistical significance.

TABLE 13: Parameter estimates.

Factor	Estimate	Sig.
FAC1	1.315	0.000
FAC2	1.264	0.000
FAC3	-0.053	0.412
FAC4	-0.388	0.013
FAC5	0.259	0.250

Sig., statistical significance.

The parameter models are significant for Factors 1, 2 and 4. The model parameters are shown in Table 13. This shows that the proposed performance dimension is important for the customer satisfaction.

Conclusion

In this paper, ISSERVQUAL is proposed to assess the service quality of the information service sector. The original SERVQUAL model presented in the literature does not fully capture the characteristics of the information systems sector especially in the fifth gap, that is, the gap in expectation versus perception. This paper proposes adding a dimension to measure the performance of the service.

The proposed ISSERVQUAL model includes the original SERVQUAL model and a proposed performance dimension consisting of eight different factors. These performance factors are features, price, consistency, drop rate, usage limit, customer service, technical support and value. The model is applied to the four ISPs in Egypt as an example. When analysing the data, seven out of the eight proposed questions were relevant to the customers in the case but other information system sectors may need the eighth.

The questionnaire is statistically analysed to find whether there is statistical difference between the expectation and the perception for each factor. A gap analysis is conducted to find whether the ISP (Etisalat, Orange, WE and Vodafone), the gender of the respondents or the status of whether the respondent pays for the service himself has a significant effect on the gap scores or not. For the internet companies, it turns out that 'Etisalat' is slightly worse than 'Vodafone' and 'Orange' in the customer perception for Factor 1 (reliability) in spite of the similar customers' expectations. It is also concluded that if a user is paying for the service by himself, then his expectation of the Factor 3 (i.e. assurance and responsiveness) is higher than users not paying by themselves. Gender is not showing a significant effect on the data at 95% confidence.

Finally, an ordinal regression model is fitted for the overall customer satisfaction based on the different factors. This model can be used to guide the upper management on where to invest for improvement. The results also showed that the suggested performance dimension along with Factor 1 (reliability) and Factor 4 (empathy) is significant for customer satisfaction.

It is crucial for companies to invest in enhancing their service quality, but there is always the dilemma of in which dimension the company should improve. Although different aspects of dimensions are important to improve, but it is always better to focus on what is important for the customer. The proposed model helps the information system sector to identify what is important for the customer and the findings highly suggest that the performance dimension is really important as discussed in the paper and should be added to the SERVQUAL model in assessing the quality gaps for the information system sector. The paper proposes a novel model for the information system sector.

Future extensions to the research include application of the proposed model in more case studies and simulation of the proposed regression in improving the satisfaction of an information service product.

Acknowledgements

The authors thank the volunteers who participated in the survey.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

R.T. and Y.A. contributed to the conceptualisation, methodology, formal analysis, writing, visualisation, software application and validation. K.A. acted as the supervisor.

Ethical considerations

An application for full ethical approval was made to the College of International Transport and Logistics, Cairo Campus, Arab Academy for Science, Transport, and Maritime Transport and ethics consent was received with an ethics waiver. The College of International Transport and Logistics, Cairo Campus, Arab Academy for Science, Transport, and Maritime Transport issued an ethics waiver for the study because the research involves no more than minimal risk to subjects.

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

The authors confirm that the data supporting the findings of this study are available within the and/or are available from the corresponding author, K.A., on reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and the product of professional research. It does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The authors are responsible for this article's results, findings and content.

References

- Ahmed, R., Vveinhardt, J., Štreimikienė, D., Ashraf, M. & Channar, Z., 2017, 'Modified SERVQUAL model and effects of customer attitude and technology on customer satisfaction in banking industry: Mediation, moderation and conditional process analysis', *Journal of Business Economics and Management* 18(5), 974–1004. <https://doi.org/10.3846/16111699.2017.1368034>

- Boakye, K., Natesan, P. & Prybutok, V., 2020, 'A correlated uniqueness model of service quality measurement among users of cloud-based service platforms', *Journal of Retailing and Consumer Services* 55, 102098. <https://doi.org/10.1016/j.jretconser.2020.102098>
- Brown, S.W. & Churchile, P.G., 2000, 'Research note improving the measurement of service quality', *Journal of Retailing and Customer Services* 4, 125–135.
- Buttler, F., 1996, 'SERVQUAL: Review, critique, research agenda', *European Journal of Marketing* 30(1), 8–32. <https://doi.org/10.1108/03090569610105762>
- Caruana, A., Ewing, M. & Ramaseshan, B., 2000, 'Assessment of the three-column format SERVQUAL', *Journal of Business Research* 49(1), 57–65. [https://doi.org/10.1016/S0148-2963\(98\)00119-2](https://doi.org/10.1016/S0148-2963(98)00119-2)
- Cisco, 2019, *White paper, Cisco visual networking index: Forecast and trends, 2017–2022*, viewed n.d., from <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-741490.pdf>.
- Cronin, J. & Taylor, S., 1994, 'Servperf versus Servqual: Reconciling performance-based and perceptions-minus-expectations measurement of service Quality', *Journal of Marketing* 58(1), 125–131. <https://doi.org/10.1177/002224299405800110>
- Da Silva, C.D. & Lins de Vasconcelos, A.M., 2020, 'Using the IDEAL model for the construction of a deployment framework of IT service desks at the Brazilian Federal Institutes of Education', *Software Quality Journal* 28, 895–929. <https://doi.org/10.1007/s11219-020-09499-x>
- Fahrurrozi, F., Murtono, M., Lestari, I., Sarifah, I. & Sari Dewi, R., 2021, 'The usefulness of online learning on quality of education during COVID-19 pandemic: Evidence from the department of elementary school teacher education at universitas negeri Jakarta, Indonesia', *International Journal dor Quality Research* 15(1), 107–124. <https://doi.org/10.24874/ijqr15.01-06>
- Gajewska, P. & Piskrzyńska, K., 2016, 'Measuring quality of maternity services using the Servqual method', *Regional Formation and Development Studies* 20(3), 50–59. <https://doi.org/10.15181/rfds.v20i3.1343>
- Gerhard, M., Christ0, B. & Deon, N., 1997, 'The dimensions of service quality: The original European perspective revisited', *The Service Industries Journal* 17(1), 173–189.
- Goetsch, D.L. & Davis, S., 2013, *Quality management for organizational excellence*, 7th edn., Pearson New International Edition, Pearson, Harlow.
- Gorla, N. & Somers, T., 2014, 'The impact of IT outsourcing on information systems success', *Information & Management* 51(3), 320–335. <https://doi.org/10.1016/j.im.2013.12.002>
- Grover, V., Cheon, M. & Teng, J., 1996, 'The effect of service quality and partnership on the outsourcing of information systems functions', *Journal of Management Information Systems* 12(4), 89–116. <https://doi.org/10.1080/07421222.1996.11518102>
- Huang, S., Bulut, E. & Duru, O., 2019, 'Service quality evaluation of international freight forwarders: An empirical research in East Asia', *Journal of Shipping and Trade* 4(1). <https://doi.org/10.1186/s41072-019-0053-6>
- Jiang, J., Klein, G., Roan, J. & Lin, J., 2001, 'IS service performance: Self-perceptions and user perceptions', *Information & Management* 38(8), 499–506. [https://doi.org/10.1016/S0378-7206\(01\)00072-6](https://doi.org/10.1016/S0378-7206(01)00072-6)
- Jonkisz, A., Karniej, P. & Krasowska, D., 2021, 'SERVQUAL method as an "old new" tool for improving the quality of Medical Services: A literature review', *International Journal of Environmental Research and Public Health* 18(20), 10758. <https://doi.org/10.3390/ijerph182010758>
- Lee, P.-C., Liang, L.-L., Huang, M.-H. & Huang, C.-Y., 2022, 'A comparative study of positive and negative electronic word-of-mouth on the SERVQUAL scale during the COVID-19 epidemic – Taking a regional teaching hospital in Taiwan as an example', *BMC Health Services Research* 22(1), 1568. <https://doi.org/10.1186/s12913-022-08930-2>
- Li, Y., Tan, K. & Xie, M., 2002, 'Measuring web-based service quality', *Total Quality Management* 13(5), 685–700. <https://doi.org/10.1080/095441202200002072>
- Liu, R., Cui, L., Zeng, G., Wu, H., Wang, C., Yan, S. et al., 2015, 'Applying the fuzzy SERVQUAL method to measure the service quality in certification & inspection industry', *Applied Soft Computing* 26, 508–512. <https://doi.org/10.1016/j.asoc.2014.10.014>
- Newman, K., 2001, 'Interrogating SERVQUAL: A critical assessment of service quality measurement in a high street retail bank', *The International Journal of Bank Marketing* 19(3), 126–139.
- Niedrich, R., Kiryanova, E. & Black, W., 2005, 'The dimensional stability of the standards used in the disconfirmation paradigm', *Journal of Retailing* 81(1), 49–57. <https://doi.org/10.1016/j.jretai.2005.01.005>
- Oakland, J.S., 2014, *Total quality management and operational excellence*, 4th edn., viewed n.d., from <http://lib.mylibrary.com/Open.aspx?id=602103>.
- Oldfield, B. & Baron, S., 2000, 'Student perceptions of service quality in a UK university business and management faculty', *Quality Assurance in Education* 8(2), 85–95.
- Parasuraman, A., 1994, 'Alternative scales for measuring service quality: A comparative assessment based on psychometric and diagnostic criteria', *Journal of Retailing* 70(3), 193–194. [https://doi.org/10.1016/0022-4359\(94\)90032-9](https://doi.org/10.1016/0022-4359(94)90032-9)
- Parasuraman, A., Zeithaml, V. & Berry, L., 1985, 'A conceptual model of service quality and its implications for future research', *Journal of Marketing* 49(4), 41–50. <https://doi.org/10.2307/1251430>
- Parasuraman, A., Zeithaml, V. & Malhotra, A., 2005, 'E-S-QUAL', *Journal of Service Research* 7(3), 213–233. <https://doi.org/10.1177/1094670504271156>
- Park, S.-J., Yi, Y. & Lee, Y.-R., 2021, 'Heterogeneous dimensions of SERVQUAL', *Total Quality Management & Business Excellence* 32(1–2), 92–118. <https://doi.org/10.1080/14783363.2018.1531700>
- Rahmat, T., Nuryani, E., Siswanto, D. & Undang, G., 2021, 'ServQual and WebQual 4.0 for usability check academic information system of private university', *Journal of Physics: Conference Series* 1869(1), 012097. <https://doi.org/10.1088/1742-6596/1869/1/012097>
- Souca, M.L., 2011, 'SERVQUAL – Thirty years of research on service quality with implications for customer satisfaction', in I. Plăiaș & R. Ciornea (eds.), *International Conference "Marketing from Information to Decision"*, 4th edn., pp. 420–429, Semantic Scholar.
- Stefano, N., Filho, N., Barichello, R. & Sohn, A., 2015, 'A fuzzy SERVQUAL based method for evaluated of service quality in the hotel industry', *Procedia CIRP* 30, 433–438. <https://doi.org/10.1016/j.procir.2015.02.140>
- Sullivan, J.R. & Walstrom, K.A., 2001, 'Consumer perspectives on service quality of electronic commerce web sites', *Journal of Computer Information Systems* 41(3), 8–14. <https://doi.org/10.1080/08874417.2001.11647001>
- Tan, K., Xie, M. & Li, Y., 2003, 'A service quality framework for web-based information systems', *The TQM Magazine* 15(3), 164–172. <https://doi.org/10.1108/09544780310469262>
- Untaru, E.N., Ispas, A. & Dan, I., 2015, 'Assessing the quality of banking services using the SERVQUAL model', *Romanian Journal of Marketing* 2, 84–92.
- Wang, H., Xie, M. & Goh, T., 1999, 'Service quality of Internet search engines', *Journal of Information Science* 25(6), 499–507. <https://doi.org/10.1177/016555159902500606>
- Wisniewski, M., 2001, 'Using SERVQUAL to assess customer satisfaction with public sector services', *Managing Service Quality* 11(6), 380–388. <https://doi.org/10.1108/EUM0000000006279>
- Wong, J., 2002, 'Service quality measurement in a medical imaging department', *International Journal of Health Care Quality Assurance* 15(5), 206–212.
- Yusefi, A.R., Davarani, E.R., Daneshi, S., Bastani, M., Mehralian, G. & Bastani, P., 2022, 'Responsiveness level and its effect on services quality from the viewpoints of the older adults hospitalized during COVID-19 pandemic', *BMC Geriatrics* 22(1), 653. <https://doi.org/10.1186/s12877-022-03344-5>