Engineering Postgraduates Perceived Service Quality and Its Association With Satisfaction And Loyalty

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Abstract—**Increasing demand for competence and effectiveness in a competitive global market has made measuring service quality a significant requirement for all successful higher education institutions. This study identifies dimensions of service quality in higher education context. The survey first assessed the level of perceived service quality, satisfaction and loyalty by using mean analysis based on a sample including 357 international engineering postgraduate students from a university in Malaysia. The 22 items of service quality used in this study were distributed into five different factors: Tangible, Reliability, Assurance, Responsiveness and Empathy. Second, the study testifies the impact of perceived service quality on satisfaction and loyalty. Third, the effect of satisfaction on loyalty is testifies. Fourth, the study confirms that Empathy has significant contributions to satisfaction and loyalty. Fifth, data analysis by assessing AHP method, prioritize and weight factors of service quality. This study also shows these students do not have positive perceived service quality, satisfaction and loyalty. In this university the international students may consider western universities as a benchmark, thus causing this university to be rated lowly.**

Keywords— Higher Learning Institution, Perceived Service Quality, Satisfaction, Loyalty

I. INTRODUCTION

Differentiating services is very essential to achieve a competitive advantage when there are many competitors in the marketplace. Providing service quality in the marketplace is a good criterion to differentiate businesses or services [7]. Service quality is defined as "consumer's overall impression of the relative inferiority/superiority of the organization and its services" [4]. Based on Berry *et al.* [3] and Iwarden *et al.* [10], there are five general dimensions or factors for measuring consumer perceptions of service quality which are itemized as follows: tangibles, reliability, responsiveness, assurance, empathy.

Based on Baca [2], service quality measurement in higher education would be more important when higher education is experiencing the pressure to align its survival and become more self-sustaining. Moreover, great efforts are expanding by top managers and legislators to improve the educational quality.

The reasons why higher education institutions should focus on service quality is cited by Lewis and Mitchell [12] as follow: "an increasing dissatisfaction with the performance of higher education systems by the public, changing demographic specifications of students, increased market forces, growth of technology and low growth rate of the economy". Braskamp [6] stated that evaluating the correcting activities which should be done in higher education is another reason for measuring service quality in higher education.

Baca [2] noted that over the past decades, universities tend to function as business institutions rather than just academic centres. Based on Gilliland [8], universities should adopt their human resources to rapid changes, complexity and uncertainty of competitive environments to survive in the "environment of unpredictability". Additionally, providing service quality products is one of the goals of a higher education institution.

It is assumed that level of perceived service quality generates satisfaction and loyalty [9]. Students' satisfaction and loyalty can be evaluated in higher education institutions according to the perceived service quality factors. This enables managers and leaders of higher education institutions to recognize the weaknesses and help them to minimize them. Satisfied and loyal students can be extremely valuable for any educational institution for donating time and money, positive advertising and as future job resources [9].

Based on the cited factors, this study focuses on the relationship between engineering students and service level institution, concentrating on the issues in which engineering students operate as customers.

II. RESEARCH FRAMEWORK

The research framework of this study offered works on three variables: perceived service quality, students' satisfaction and students' loyalty, within international engineering postgraduate students. Analytic Hierarchy Process (AHP) method was implemented to prioritize and weight the most dominant factors of service quality.

As Figure 1 exhibits this study investigates the relationship between the service quality constructs of tangible, reliability, assurance, responsiveness, empathy, the satisfaction, and the loyalty among engineering postgraduate students. This paradigm has been used by some researchers. For instance, Arambewela and Hall [1] and Parasuraman et al. [13].
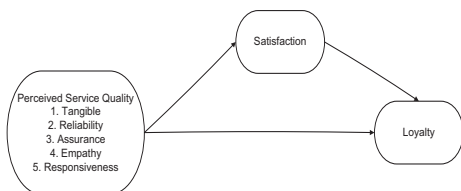

FIGURE 1: CONCEPTUAL FRAMEWORK OF THE STUDY

III. RESEARCH METHODOLOGY

In this study, a quantitative method was chosen to analyze the service quality perception of engineering postgraduate international students. The population comprised of 4566 international engineering postgraduate students who enrolled in the university at that semester. From this population a sample of 357 students were selected according to Krejcie and Morgan [11]. In the beginning, descriptive statistics were used to analyse demographics of the samples and level of each construct. Then, inferential statistics such were used to find out the impact of each variable on each other. These descriptive and inferential statistics were done by software SPSS. Finally, AHP method was used to prioritize and weight the dominant factors of service quality. For doing this, software Expert Choice was used.

IV. DATA ANALYSIS

Reliability analysis was carried out towards the five factors of service quality and satisfaction and loyalty variables in this survey to examine the consistency of the results obtained and to ensure that items relating to each factor correlated. The reliability of the factors and variables was analyzed by Cronbach's Alpha Test. Based on this test, all the factors were reliable to do future analysis. At first, mean analysis was used to identify the level of students' perceived service quality, satisfaction and loyalty. Table 2 showed the analysis of the level of students' perceived service quality, satisfaction and loyalty. Based on this table, respondents had moderate level of perceived service quality with the mean value of 3.13. This indicates that the university service quality was accepted by students but not reach a high level of perception yet. Students had moderate level of perceived service quality toward all dimensions of service quality. Assurance and tangible had the most level of perception which had 3.24 and 3.23 mean value respectively. It indicates that assurance and tangible is more acceptable for students in the unversity. Reliability with the

mean value of 3.11 is the next acceptable dimension of service quality by students. Based on the mean values, responsiveness and empathy were less acceptable as students' view of point. The mean value of 3.05 for these two factors showed that perception of them was less than other three factors of service quality.

TABLE 1: MEAN AND LEVEL OF THE FACTORS OF STUDENTS' PERCEIVED SERVICE QUALITY

Constructs	Mean	Level
Tangible	3.23	Moderate
Reliability	3.11	Moderate
Assurance	3.24	Moderate
Responsiveness	3.05	Moderate
Empathy	3.05	Moderate
Total Perceived Service Quality	**3.13**	**Moderate**

Table 3 identified the mean and level of satisfaction and loyalty toward the University. Table 2 represented that the level of both variables was moderate. It meant that students are not completely satisfied or dissatisfied. Moreover, they were not loyal to the University, but they also did not really mean not to be loyal. The mean value for satisfaction and loyalty among the international engineering postgraduate students were 2.86 and 2.79 respectively which were the moderate level of satisfaction and loyalty.

TABLE 3: MEAN AND LEVEL OF STUDENTS' SATISFACTION AND LOYALTY

Variables	Mean	Level
Satisfaction	2.86	Moderate
Loyalty	2.79	Moderate

To determine the impact of Perceived service quality on other variables, linear regression was used. This method is used to describe the effect of one variable to another variable. First, the impact of perceived service quality on satisfaction will be analysed.

H_0 and H_1 hypothesis were defined to study the significant effects between perceived service quality and satisfaction.

H_0: perceived service quality has no significant effect on satisfaction.

H_1: perceived service quality has significant effect on satisfaction.

Table 3 represents the summery of linear regression between perceived service quality and satisfaction This template was designed for two affiliations.

TABLE 3: LINEAR REGRESSION BETWEEN SERVICE QUALITY AND SATISFACTION

R	R Square	Adjusted R Square	B	Sig
0.738	0.545	0.543	0.738	0.000

Findings showed the significant impact of perceived service quality towards satisfaction (Sig<0.000). So H_0 would be rejected and the alternative hypothesis which shows a significant effect of perceived service quality on satisfaction was accepted. The strength of the relationship was determined

by R=0.738. R square = 0.545 showed the impact of perceived service quality on satisfaction. This explained 54.5% perceived service quality affect the satisfaction.

The linear regression equation to forecast the satisfaction based on perceived service quality is as follow: For author/s of more than two affiliations:

The linear regression equation to forecast the satisfaction based on perceived service quality is as follow:

$$Y = a + bX$$

Where,
Y = satisfaction/loyalty
X = Perceived service quality
a = constant
b = regression coefficient

Table 4 shows the coefficient of linear regression between perceived service quality and satisfaction.

TABLE 4: COEFFICIENT OF LINEAR REGRESSION BETWEEN SERVICE QUALITY AND SATISFACTION

Model	Coefficient (B)
(constant)	0.138
Perceived service quality	0.867

From the table above, the linear regression equation can be determined by B value as:

Satisfaction = 0.138 + 0.867 * (perceived service quality)

The equation meant that the increase of perceived service quality will increase the students' satisfaction. This indicates that the increase for every unit of perceived service quality, a 0.867 unit increase of students' satisfaction was predicted.

Afterward, a new set of H_0 and H_1 hypothesis were defined to determine the significant effects between perceived service quality and loyalty.

H_0: perceived service quality has no significant effect on loyalty.
H_1: perceived service quality has significant effect on loyalty.

Table 5 represents the summery of linear regression between perceived service quality and loyalty.

TABLE 5: LINEAR REGRESSION BETWEEN SERVICE QUALITY AND LOYALTY

R	R Square	Adjusted R Square	B	Sig
0.675	0.456	0.454	0.675	0.000

Results of this table showed the significant impact of perceived service quality towards loyalty (sig<0.000). So H_0 would be rejected and H_1 which shows a significant impact of perceived service quality on loyalty was accepted. The strength of the relationship was determined by R=0.675. The impact of perceived service quality on loyalty was 45.4% (R square = 0.454). This explained 45.4% perceived service quality affect the loyalty.

The linear regression equation to forecast the loyalty based on perceived service quality is as follow:

$$Y = a + bX$$

Where,
Y = Loyalty
X = Perceived service quality
a = constant
b = regression coefficient

Table 6 shows the coefficient of linear regression between perceived service quality and loyalty.

TABLE 6: COEFFICIENT OF LINEAR REGRESSION BETWEEN SERVICE QUALITY AND LOYALTY

Model	Coefficient (B)
(constant)	-0.483
Perceived service quality	1.043

From the table above, the linear regression equation can be determined by B value as:

Loyalty = -0.483 + 1.043 * (perceived service quality)

The equation meant that the increase of perceived service quality will increase the students' loyalty. This indicates that the increase for every unit of perceived service quality, a 1.043 unit increase of students' loyalty was predicted.

A new set of H_0 and H_1 hypothesis were defined to determine the significant effects between students' satisfaction and loyalty.

H_0: satisfaction has no significant effect on loyalty.

H_1: satisfaction has significant effect on loyalty.

Table 7 indicates the summery of linear regression between satisfaction and loyalty

TABLE 7: LINEAR REGRESSION BETWEEN SATISFACTION AND LOYALTY

R	R Square	Adjusted R Square	B	Sig
0.786	0.618	0.616	0.786	0.000

Findings showed the significant impact of perceived service quality towards loyalty (sig<0.000). So H_0 would be rejected and the H_1 hypothesis which shows a significant impact of satisfaction on loyalty was accepted. The strength of the relationship was determined by R=0.786. The impact of satisfaction on loyalty, according to R square = 0.454, was 45.4%.

The linear regression equation to forecast the loyalty based on satisfaction is as follow:

$$Y = a + bX$$

Where,
Y = loyalty
X = satisfaction
a = constant
b = regression coefficient

Table 8 shows the coefficient of linear regression between satisfaction and loyalty.

TABLE 8: COEFFICIENT OF LINEAR REGRESSION BETWEEN SATISFACTION AND LOYALTY

Model	Coefficient (B)
(constant)	-0.164
Perceived service quality	1.033

From the table above, the linear regression equation can be determined by B value as:

$$Loyalty = -0.164 + 1.033 * (satisfaction)$$

The equation indicates that the increase of satisfaction will increase the students' loyalty. This means that the increase for every unit of satisfaction will increase the students' loyalty as 1.033 units.

Multiple regression was developed to identify the impact of factors of perceived service quality on students' satisfaction and loyalty. For this, first the impact of all dimensions of service quality on satisfaction was measured. After that this impact would be measured for service quality factors on loyalty. The significant level of 0.05 was used. Factors which were not significant were being removed according to the significant level of the regression technique.

For measuring the impact of service quality factors on satisfaction, the dependent variable was students' satisfaction and the independent variables included service quality dimensions (tangible, reliability, assurance, responsiveness, and empathy). The multiple regression equation is as follow:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

Where,
Y = satisfaction
X_1 = tangible
X_2 = reliability
X_3 = assurance
X_4 = responsiveness
X_5 = empathy
a = constant
b_1, b_2, b_3, b_4, b_5 = partial regression coefficients

To achieve the impact of service quality factors on satisfaction, H_0 and H_1 were considered as bellow:

H_0: service quality factors have no significant impact on satisfaction.
H_1: service quality factors have significant impact on satisfaction.

Table 9 shows the summary of the multiple regression analysis.

TABLE 9: MULTIPLE REGRESSION BETWEEN SERVICE QUALITY FACTORS AND SATISFACTION

R	R Square	Adjusted R Square	Sig
0.746	0.556	0.548	0.000

The p-value is 0.000 which indicates that the H_0 will be rejected and consequently, H_1 will be accepted. It meant that there is a significant impact of service quality dimensions on satisfaction. The R value was 0.746 which meant that 74.6% of the students' satisfaction toward the university could be predicted by service quality dimensions where students' satisfaction was served as dependent variable while service quality factors were the independent variables. On the other hand, the R Square for this regression was 0.556, so that 55.6% of the variation in the students' satisfaction toward the university was influenced by service quality dimensions.

TABLE 10: COEFFICIENT OF MULTIPLE REGRESSION BETWEEN SERVICE QUALITY FACTORS AND SATISFACTION

Model	Coefficient (B)	Standardized Coefficient (β)	Sig.
(constant)	0.198		0.007
Tangible	0.140	0.129	0.037
Reliability	0.026	0.025	0.670
Assurance	0.216	0.212	0.003
Responsiveness	0.215	0.206	0.010
Empathy	0.253	0.258	0.000

From the table above, reliability does not have significant impact on satisfaction, because the p-value (0.670) is larger than 0.05. The multiple regression equation for other factors can be determined by B values as:

$$Satisfaction = 0.198 + 0.140*(tangible) + 0.216*(assurance) + 0.215*(responsiveness) + 0.253*(empathy)$$

The equation meant that the increase of all of the tangible, assurance, responsiveness, and empathy will increase the students' satisfaction of the university. As a conclusion, tangible (sig. = 0.037), assurance (sig. = 0.003), responsiveness (sig. = 0.010), and empathy (sig. = 0.000) had the linear relationship with students' satisfaction. This indicates that the increase for every unit of tangible, assurance, responsiveness, and empathy, a 0.140, 0.216, 0.215, and 0.253 unit of students' satisfaction was expected to be increased respectively.

For that reason, the most dominant factor that affected the satisfaction of the students was empathy because it obtained the largest Standardized Coefficient score (0.258), followed by assurance (Standardized Coefficient = 0.212), responsiveness (Standardized Coefficient = 0.206), and tangible (Standardized Coefficient = 0.129).

Multiple regression was developed to identify the impact of service quality dimensions on students' loyalty. Factors which were not significant were being removed according to the significant level of the regression technique. The dependent variable was students' loyalty and the independent variables included service quality dimensions (tangible, reliability, assurance, responsiveness, and empathy). The multiple regression equation is as follow:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

Where,
Y = loyalty
X_1 = tangible
X_2 = reliability
X_3 = assurance

X_4 = responsiveness
X_5 = empathy
a = constant
b_1, b_2, b_3, b_4, b_5 = partial regression coefficients

To achieve the impact of service quality dimensions on loyalty, H_0 and H_1 were defined as follow:

H_0: service quality factors have no significant impact on loyalty.
H_1: service quality factors have significant impact on loyalty.

Table 11 shows the summery of the multiple regression analysis.

TABLE 11: MULTIPLE REGRESSION BETWEEN SERVICE QUALITY FACTORS AND LOYALTY

R	R Square	Adjusted R Square	Sig
0.689	0.475	0.466	0.000

The p-value is 0.000 which indicates that the H_0 will be rejected and consequently, H_1 will be accepted. It meant that there is a significant impact of service quality dimensions on loyalty. The R value was 0.689 which meant that 68.9% of the students' loyalty toward the university could be predicted by service quality factors where students' loyalty was considered as dependent variable and service quality factors were the independent variables. On the other hand, the R Square for this regression was 0.475, so that 47.5% of the variation in the students' loyalty toward the university was influenced by service quality dimensions.

TABLE 12: COEFFICIENT OF MULTIPLE REGRESSION BETWEEN SERVICE QUALITY FACTORS AND LOYALTY

Model	Coefficient (B)	Standardized Coefficient (β)	Sig.
(constant)	-0.433		0.011
Tangible	0.285	0.200	0.003
Reliability	-0.020	-0.015	0.823
Assurance	0.182	0.135	0.083
Responsiveness	0.197	0.144	0.098
Empathy	0.384	0.299	0.000

From Table 12 above, reliability, assurance and responsiveness did not have significant effect on loyalty, because the p-value (0.823, 0.083, and 0.098 respectively) are larger than 0.05. The multiple regression equation for tangible and empathy can be determined by B values as:

Loyalty = -0.433 + 0.285*(tangible) + 0.384*(empathy)

The equation meant that the increase of all of the tangible and empathy will increase the students' loyalty toward the university. As a conclusion, tangible (sig. = 0.003) and empathy (sig. =0.000) had the linear relationship with students' loyalty. This indicates that the increase for every unit of tangible and empathy, a 0.285 and 0.384 unit of students' loyalty was expected to be increased respectively.

For that reason, the most dominant factor that affected the loyalty of students was empathy because it obtained the largest Standardized Coefficient score (0.384), followed by tangible (Standardized Coefficient = 0.285).

Based on the results, empathy had the most impact on both satisfaction and loyalty of students. This meant that empathy

was always the key factor in students' satisfaction and loyalty. Moreover, reliability was the only factor that was not dominant in students' satisfaction and loyalty.

AHP which functions based on pairwise comparison was used to determine the dominant dimensions of service quality. For doing the pairwise comparison, a 1 to 9 scale was considered to compare the dimensions pair wisely. Equally preferred factors will be rated as 1 and extremely preferred dimensions would be rated as 9. According to the preference of each factor, each number in this range would be devoted to them.

Table 13 shows the pairwise comparison between five dimensions of service quality.

TABLE 13: PAIRWISE COMPARISON BETWEEN SERVICE QUALITY FACTORS

	Tangible	Rel.	Assur.	Response	Empathy
Tangible	1	5	2	3	1/2
Reliability	1/5	1	1/2	½	1/6
Assurance	1/2	2	1	1	1/3
Response	1/3	2	1	1	1/3
Empathy	2	6	3	3	1

Table 14: represents the weight of each dimension measured by AHP method.

TABLE 14: WEIGHT OF EACH DIMENSION OF SERVICE QUALITY BASED ON AHP

Dimension	Weight
Tangible	0.279
Reliability	0.061
Assurance	0.128
Responsiveness	0.119
Empathy	0.413

This table shows the importance and weight of each dimension. According to this table, empathy was the most dominant factor of service quality (weight = 0.413). Afterward, tangible (weight = 0.279), assurance (weight = 0.128), responsiveness (weight = 0.119), and reliability (weight = 0.061) were the most dominant factors of service quality by using AHP method. This indicates that empathy is a vital factor according to students' perspective and managers of the university must pay more attention to this factor.

V. RECOMMENDATION

The results of this study had significant implications for policy and practice in relation to the university's management development. This study showed that international engineering postgraduate students in the university did not have positive perceptions of education service quality in their university. They were not completely satisfied with the education service quality on all the five quality factors. In the case of the university, international students may consider other high-ranking universities as a general class for higher engineering education and benchmark this university with these institutions which are very well established.

Adjustment phenomenon among international students may also cause low satisfaction. According to Black [5], adjustment is the degree of a person's psychological comfort with various

aspects of a new setting. Attending a university in another country is very stressful, and foreign students must make many adjustments. If the adjustment is not successful, it can possibly cause international students to feel dissatisfaction. Adjusting to a different culture is not the only adjustment a foreign student must make. They can also find difficulty in adjusting to the academic setting of a university. Many of these students are secure in their home setting, but in a new environment they face differences in classroom protocol, quality of education, and methods of communication. These changes affect their attitudes toward their new environment.

Another cause possibly relates to communal interaction. Studies indicate that very few people can have a successful sojourn without extensive interaction with their hosts and good interpersonal relationships with them [14]. Smith *et al.* [14] stated that international students, who do not have satisfactory relationships with their host students and do not desire interpersonal relationships, are generally dissatisfied.

Besides, students' expectation and requirement are increased over the years. So, enhancement of the service quality can be a way to absorb more international students and keep them loyal toward the university. Personalize services will make the students feel they are important to the university then tend to use or repurchase the service continuously. This will build up the university competitive advantages over the competitors.

The most dominant factor affecting students' satisfaction and loyalty was empathy. This means that individual attention to students plays an important role in students' satisfaction and loyalty. Thus, the university needs to develop exclusive value-added services that can make students happy to study and always like to share their experiences in the university to others.

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