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The development of HEdPERF: a new measuring instrument of service quality for the higher education sector

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Preface

Service quality has attracted considerable attention within the tertiary education sector, but despite this, little work has been concentrated on identifying its determinants from the standpoint of students being the primary customers. Thus, it would seem rational to develop a new measurement scale that incorporates not only the academic components, but also aspects of the total service environment as experienced by the student. Likewise, there are many areas of disagreement in the debate over how to measure service quality, and recent research has raised many questions over the principles on which the existing instruments are founded. Although these generic instruments have been tested with some degree of success in wide-ranging service industries, but their replication in higher education sector is still hazy.

This paper describes the methodological development of HEdPERF (Higher Education PERFormance-only), a new measuring instrument of service quality that captures the authentic determinants of service quality within the higher education sector. The proposed 41-item instrument has been empirically tested for unidimensionality, reliability and validity using both exploratory and confirmatory factor analysis (CFA). Such valid and reliable measuring scale would be a tool that tertiary institutions could use to improve service performance in the light of increased competition with the development of global education markets. The results from the current study are crucial because previous studies have produced scales that bear a resemblance to the generic measures of service quality, which may not be totally adequate to assess the perceived quality in higher education. Furthermore, previous researches have been too narrow, with an over-emphasis on the quality of academics and too little attention paid to the non-academic aspects of the educational experience.

Research findings confirmed that the six dimensions, namely, non-academic aspects, academic aspects, reputation, access, programme issues and understanding were distinct and conceptually clear. Therefore, it can be posited that student perceptions of service quality can be considered as a six-factor structure consisting of the identified six dimensions. Consequently, tertiary institutions should assess all the six dimensions of service quality to ascertain the level of services provided, and to determine which dimensions need improvement. Evaluating service quality level and understanding how various dimensions impact overall service quality would ultimately enable tertiary institutions to efficiently design the service delivery process. In addition, knowing the strengths and weaknesses of these dimensions and their relative influence may result in better allocation of resources so as to provide a better service to students.

While many service quality attributes may influence a student's perception to a certain extent, the results also indicate that *access*, which relates to such aspects as approachability, ease of contact, availability and convenience has significantly influenced the overall service quality perception. In other words, students perceived *access* to be more important than other dimensions in determining the quality of the service that they received. Tertiary institutions should therefore concentrate their efforts on the dimension perceived to be important rather than focusing their energies on a number of different attributes, which they feel are important determinants of service quality. While the idea of providing adequate service on all dimensions may seem attractive to most service marketers and managers, failure to prioritize these attributes may result in inefficient

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allocation of resources. However, these findings do not mean that tertiary institutions should neglect other service quality dimensions, such as non-academic aspects, academic aspects, reputation, programme issues and understanding. It is important for tertiary institutions to provide adequate service on all dimensions, and then possibly to ascertain which dimensions may require greater attention. For instance, quality improvement programmes should address not only the performance of service delivery by the academics, but also the various aspects surrounding the educational experience such as physical facilities, and the multitude of support and advisory services offered by the institutions.

Keywords Service quality, measuring instrument, higher education, unidimensionality.

Introduction

Nowadays, higher education is being driven towards commercial competition imposed by economic forces resulting from the development of global education markets and the reduction of government funds that forces tertiary institutions to seek other financial sources. Tertiary institutions had to be concerned with not only what the society values in the skills and abilities of their graduates (Ginsberg, 1991; Lawson, 1992), but also how their students feel about their educational experience (Bemowski, 1991). These new perspectives call attention to the management processes within the institutions as an alternative to the traditional areas of academic standards, accreditation and performance indicators of teaching and research.

Tertiary educators are being called to account for the quality of education that they provide. While more accountability in tertiary education is probably desirable, the mechanisms for its achievement are being hotly debated. Hattie (1990) and Soutar and McNeil (1996) oppose the current system of centralized control, in which the government sets up a number of performance indicators that are linked to funding decisions. There are a number of problems in developing performance indicators in tertiary education. One such problem is that performance indicators tend to become measures of activity rather than true measures of the quality of students' educational service (Soutar and McNeil, 1996). These performance indicators may have something to do with the provision of tertiary education, but they certainly fail to measure the quality of education provided in any comprehensive way.

A survey conducted by Owlia and Aspinwall (1996) examined the views of different professionals and practitioners on the quality in higher education and concluded that customer-orientation in higher education is a generally accepted principle. They construed that from the different customers of higher education, students were given the highest rank. The marketing principle, which suggests that corporate strategy should flow from consumer needs, has not been given much credence in the discussions of accountability in the tertiary education sector. Student experience in a tertiary education institution should be a key issue of which performance indicators need to address. Thus, it becomes important to identify determinants or critical factors of service quality from the standpoint of students being the primary customers. In addition, it would seem rational to use a newly adapted measurement tool on the basis of previously identified determinants to evaluate not only the teaching component of tertiary institutions, but also to include aspects of the total service environment as experienced by the student.

Likewise, a review of literature shows that there are many areas of disagreement in the debate over how to measure service quality. Recent research has raised many questions over the principles on which the current instruments are founded. The use of existing measures as a means of measuring service quality throughout the marketing sectors may have been tested with some degree of success, but this may not be the case for other service sectors particularly higher education. As such, it may not be fruitful to continue pursuing the development of a standard measurement scale applicable to a wide variety of services. Instead, an instrument that is exclusively designed for a particular industry is a more viable research strategy to pursue. It is against this backdrop that HEdPERF, a new service quality measurement instrument, is developed and tested empirically.

Background and literature review

In higher education, the definition of customer is quite different from the manufacturing or general services

since groups such as students, employers, academic staff, government and families are all customers of the education system with a diversity of requirements. In British higher educations, students must now be considered 'primary customers' (Crawford, 1991). Weaver (1976) sees four parties as potential customers, namely, the government, its administrators, teachers/academics and actual consumers (learners, their families, employers and society as a whole). Galloway (1998) seems to concur with the general view that the primary participant in the service education is the student.

Nowadays, tertiary educators are being called to account for the quality of education that they provide. While more accountability in tertiary education is probably desirable, the mechanisms for its achievement are being hotly debated. Hattie (1990) and Soutar and McNeil (1996) oppose the current system of centralized control, in which the government sets up a number of performance indicators that are linked to funding decisions. According to Soutar and McNeil (1996), these performance indicators may have something to do with the provision of tertiary education, but they certainly fail to measure the quality of education provided in any comprehensive way. Likewise, Hittman (1993) was particularly critical of the traditional approach to quality assessment in tertiary institutions. He suggests that the approach has been too narrow, with an over-emphasis on the quality of academics and too little attention paid to the non-academic aspects of the educational experience. As such, it becomes important to identify determinants or critical factors of service quality from the standpoint of students.

Limitations of existing service quality measures

The word 'service' has a significant richness and diversity of meaning. As such, progress in designing and developing a generic framework within which to measure service quality is hampered by the inherent problems that are commonly associated with the unique characteristics of service, namely, intangibility, inseparability, perishability and heterogeneity (Zeithaml *et al.*, 1985). Likewise, many researchers (Parasuraman *et al.*, 1985; Carman, 1990; Bolton and Drew, 1991) concur that service quality is an elusive concept and there is considerable debate in the literature about how best to conceptualize this phenomenon. Lewis and Booms (1983, p. 100) were perhaps the first to define service quality as '. . . a measure of how well the service level delivered matches the customer's expectations'. Thereafter, there seems to be a broad consensus that service quality is an attitude of overall judgement about service superiority, although the exact nature of this attitude is still hazy.

The most widely used methods applied to measure service quality can be categorized as quantitative multi-attribute measurements. Within the attribute-based methods, a great number of variants exist and among these variants, the SERVQUAL instrument (Parasuraman *et al.*, 1985) has attracted the greatest attention claiming to measure the relevant dimensions of the perceived quality across all service industries. It is a 22-item scale for measuring service quality along five dimensions, namely, reliability, responsiveness, assurance, empathy and tangibles. SERVQUAL operationalizes service quality by subtracting customers' expectation scores from perception scores with respect to the 22 items. Ever since its inception more than a decade ago, SERVQUAL has been widely used across different service industries. Despite its popularity, a number of criticisms was directed at SERVQUAL, aimed at both the conceptual and the operational level.

Cronin and Taylor (1992) claim that there is little evidence, either theoretical or empirical, to support the notion of the 'expectations minus performance' gap as a basis for measuring service quality. They refute the framework of SERVQUAL and propose a 'performance only' measure of service quality called SERVPERF. In their empirical work, they claim that SERVPERF scale (performance-only) performs better than any other measure of service quality. In another research work, Teas (1993) discusses the conceptual and operational difficulties of using the 'expectations minus performance' approach, with a particular emphasis on expectations. His empirical test subsequently produce two alternatives of perceived service quality measures, namely, Evaluated Performance (EP) and Normed Quality (NQ). He concludes that the EP instrument, which measures the gap between perceived performance and the ideal amount of a feature rather than the customer's expectations, outperforms both SERVQUAL and NQ.

In higher education, quality measurement is intensifying with increased emphasis on education accountability. Nonetheless, many researchers used the adapted version of SERVQUAL to evaluate students' course experience within a business school as part of the quality assurance system (Rigotti and Pitt, 1992; McElwee and Redman, 1993; Hill, 1995; Cuthbert, 1996; Oldfield and Baron, 2000). Ho and Wearn (1996) incorporated SERVQUAL into HETQMEX, a higher education TQM excellence model. Whilst in nurse education, Hill *et al.* (1996) devised a quality instrument for post-registration nurse education derived from existing literature sources for module management. The conclusion appears to be that many researchers are undertaking customization of established service quality dimensions in higher education in their measurement instruments.

Indeed there are many gray areas in the debate over how to measure service quality. The argument regarding the gaps (SERVQUAL), perceptions-only (SERVPERF) and EP approaches to measuring service quality is still unresolved as there are valid issues and suggestions on either side of this debate. The general view appears to be that, although SERVQUAL, SERVPERF and EP were designed as generic measures of service quality that have cross-industry applicability, it is important to view the instruments as basic 'skeletons' that often require modification to fit the specific application situation and supplemental context-specific items. Without doubt the use of these approaches as a means of measuring service quality throughout the marketing sectors may have been tested with some degree of success, but this may not be the case for other service sectors, namely, higher education.

With all these seemingly irreconcilable problems associated, perhaps the time has come to 'bury' the existing instruments and attempt to reconstruct or redefine service quality from a new and different perspective. Thus, the general conclusion appears to be that industry-specific service quality measures may be a more viable research strategy to pursue (Zeithaml *et al.*, 1985; Carman, 1990; Finn and Lamb, 1991; Cronin and Taylor, 1992; Brown and Koenig, 1993). As it stands, the generic measures of service quality may not be a totally adequate instrument by which to assess the perceived quality in higher education, although their impact in the service quality domain is undeniable.

Research methodology

The purpose of this study was to develop and validate HEdPERF, a new measurement scale of service quality specifically designed for higher education sector using both qualitative and quantitative measures. The various steps involved in the development and validation of HEdPERF are shown by means of flow chart in Fig. 1. In particular, the study attempts to qualitatively determine critical factors of service quality from students'

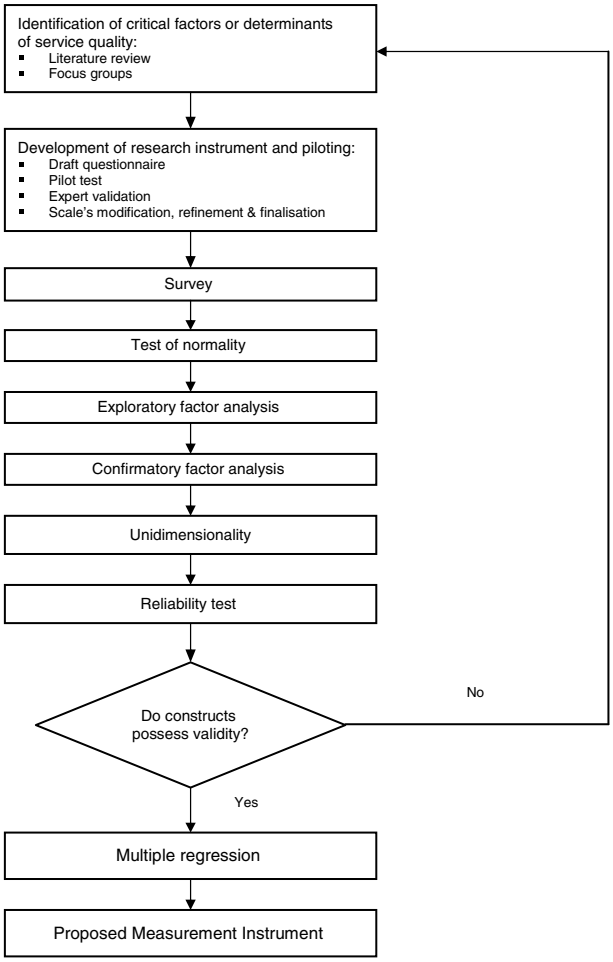

Figure 1 Development and validation of HEdPERF.

perspective being the primary customers, to incorporate the qualitatively generated determinants of service quality into a Likert-type instrument, and to administer the instrument to a sample population consisting of students within higher education sector. Below is a detailed description of the research stages:

Stage 1: identification of critical factors or determinants of service quality

This involves in-depth searching of the literature to ascertain the determinants of service quality in addition to a series of focus groups. A total of 16 carefully selected past and present students from various tertiary institutions in Malaysia were invited to participate in the focus groups. These representative groups of six to seven individuals identified a series of relevant service quality evaluation criteria or critical factors. A facilitated discussion around set of questions was led by the researcher, and during these group interviews, participants were asked to describe various aspects related to the services and facilities offered.

Stage 2: development of research instrument and piloting

The literature review together with three focus group interviews provided the basis for generating items for inclusion in the draft questionnaire. The draft questionnaire consisted of three sections A, B and C. Section A contained 9 questions pertaining to respondent profile. Whereas section B contained 45 items related to different aspects of tertiary institution's service offering. The items were presented randomly as statements on the questionnaire, with the same rating scale used throughout. The items were measured on a 7-point, Likert-type scale that varied from 1 = strongly disagree to 7 = strongly agree. In addition to the main scale addressing individual items, respondents were asked in Section C to provide an overall rating of the quality service, satisfaction level and future visit. The draft questionnaire was eventually subjected to pilot testing with a total of 30 representative students drawn from various tertiary institutions in Malaysia, and subsequently submitted to 10 experts (academicians, researchers and practitioners) for feedback before being administered for a full-scale survey. They were asked to comment on any perceived ambiguities, omissions or errors concerning the draft questionnaire, and consequently changes were made accordingly.

Stage 3: survey

Data had been collected from students of six tertiary institutions throughout Malaysia for the period June to August 2003. Data were collected using the 'personal-contact' approach whereby 'contact persons' (academic or administrative staff of the selected institutions) have been approached personally, and the survey explained in detail. The final questionnaire together with a covering letter was subsequently handed personally to the 'contact persons' who in turn distributed it to the students.

A total of 680 students from six tertiary institutions have been surveyed from whom 409 corrected completed questionnaires have been obtained, yielding a response rate of 60.1%. Out of 409 students who responded to the questionnaire, 64.3% were female, and 67.0% were *bumiputera* (natives of Malaysia). A total of 226 or 55.3% of respondents were in the 21–35 years age range, and majority of them or 90.2% were full-time students. Most of the respondents or 92.3% were enrolled in either their first, second or third year of the diploma programme, and nearly 188 or 34.7% of them were enrolled in either business administration or engineering programme. As for the overall rating of the quality service, satisfaction level and future visit, majority of respondents gave their positive views with means at 4.8, 4.6 and 4.5, respectively, of the 7-point Likert scale.

Results and discussion

Test of normality

The role played by the assumption of normality which underlies most methods of multivariate analysis is overwhelmingly crucial in this study. There is a general tendency in the statistical literature to represent features of the data as adequately as possible in order to reduce any unrealistic assumptions. Multivariate normal distribution can serve as an approximate sampling distribution for many statistics, namely, factor analysis, which was used extensively in this study. This underlying

statistical assumption impacts factor analysis to the extent that it affects the derived correlations (Hair *et al.*, 1995). In other words, departures from normality can diminish correlations between variables.

The Mahalanobis distance is suggested in many texts as a method for detecting outliers in multivariate data. Denoted by D^2, the index was used in checking multivariate normality of the data, and there are two ways in computing D^2. The first method is rather old-fashioned as it involves getting D^2 for each subject, and plotting it against the quantiles of the χ^2 (Chi-Square) distribution (Johnson and Wichern, 1992). However, a newer method developed by Rencher (2002) involves transforming the sample Mahalanobis distance and plotting it against β (Beta) quantiles. In both methods, a nonlinear pattern indicates departure from multivariate normality. The scatterplots of *chisq_q* vs. *di_sq* (Method 1) and *neu_i* vs. *ui* (Method 2) are shown in Fig. 2. The fit for both methods is good, $R^2 = 0.814$ and $R^2 = 0.805$, respectively, and the plot is almost linear thus implying that the data is multivariate normal.

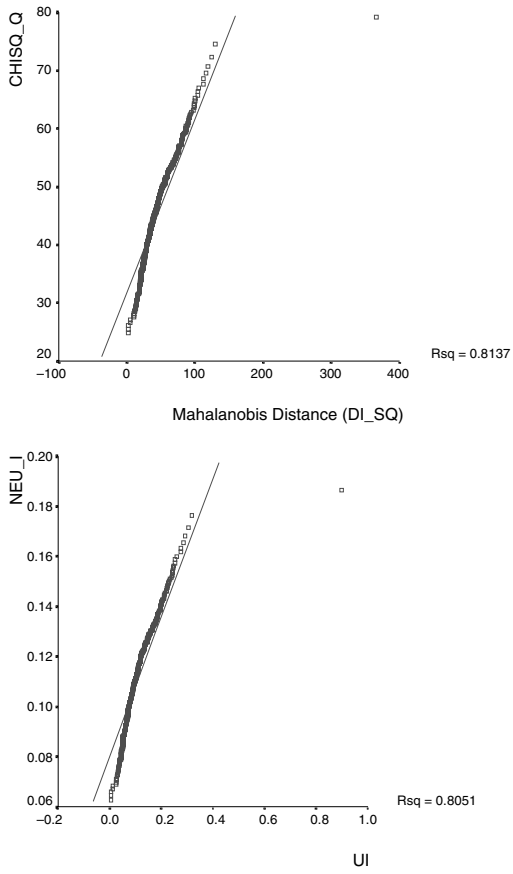

Figure 2 Scatterplot of mahalanobis distance, D^2.

Factor analysis

Factor analysis was used in this study to identify the dimensional structure of service quality within higher education sector. One critical assumption underlying the appropriateness of factor analysis is to ensure that the data matrix has sufficient correlations to justify its application (Hair *et al.*, 1995). A first step is visual examination of the correlations, identifying those that are statistically significant. Inspection of the correlation matrix reveals that practically all correlations are significant at $P = 0.01$, and this certainly provides an excellent basis for factor analysis.

The next step involves assessing the overall significance of the correlation matrix with Bartlett test of sphericity, which provides the statistical probability that the correlation matrix has significant correlations among at least some of the variables. The results were significant, $\chi^2(45,\ n = 409) = 13\,052$ $(P = 0.01)$, a clear indication of suitability for factor analysis. Finally, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was computed to quantify the degree of intercorrelations among the variables, and the results indicate an index of 0.96, a 'marvelous' sign of adequacy for factor analysis (Kaiser, 1970). As for the adequacy of the sample size, there is a 9-to-1 ratio of observations to variables in this study, which falls within acceptable limits.

In order to gain a better understanding of the factor structure, all the 45 items from Section B of the questionnaire were subjected to a factor analysis utilizing the principal components procedure, which was followed by a varimax rotation. The decision to include a variable in a factor was based on factor loadings greater than ±0.3 (Hair *et al.*, 1995), and all factors whose eigenvalues was greater than 1.0 were retained in the factor solution (Tabachnick and Fidell, 1989). The choice regarding factor loadings greater than ±0.3 was not based on any mathematical proposition but relates more to practical significance. According to Hair *et al.* (1995, p. 385),

factor loadings of 0.3 and above are considered significant at $P = 0.05$ with a sample size of 350 respondents ($n = 409$ in this study).

The variable's communality, which represents the amount of variance accounted for by the factor solution for each variable was also assessed to ensure acceptable levels of explanation. The results show that communalities in four variables were below 0.50, '. . . too low for having sufficient explanation (Hair *et al.*, 1995, p. 387). Subsequently, a new factor solution was derived with the non-loading variables eliminated and the results yielded six factors of service quality within higher education, which accounted for 65.2% of the variation in the data (compared with 62.5% of the variance explained in the first factor solution). Table 1 shows the results of the factor analysis in terms of factor name, the variables loading on each factor and the variance explained by each factor. The six factors identified in Table 1 can be described as follows:

- Factor 1: non-academic aspects. This factor consists of items that are essential to enable students fulfil their study obligations, and it relates to duties carried out by non-academic staff.
- Factor 2: academic aspects. The items that describe this factor are solely the responsibilities of academics.
- Factor 3: reputation. This factor is loaded with items that suggest the importance of higher learning institutions in projecting a professional image.
- Factor 4: access. This factor consists of items that relate to such issues as approachability, ease of contact, availability and convenience.
- Factor 5: programmes issues. This factor emphasizes the importance of offering wide ranging and reputable academic programmes/specializations with flexible structure and syllabus.
- Factor 6: understanding. It involves items related to understanding students' specific need in terms of counselling and health services.

The results presented in Table 1 are certainly related to the determinants of service quality and support the existing literature. Factor 1 (non-academic aspects) and Factor 2 (academic aspects) were identified as important quality indicators (Surprenant and Solomon, 1987; Crosby *et al.*, 1990; Soutar and McNeil, 1996; Leblanc and Nguyen, 1997). While, reputation (Factor 3) is extensively described as an important determinant of service quality in higher education (Lehtinen and Lehtinen, 1982; Gronroos, 1984; Joseph and Joseph, 1997; Ford *et al.*, 1999).

Access (Factor 4) on the other hand is related to availability, approachability, ease of contact and convenience, and it was proposed as an important dimension by many prominent service quality researchers (Parasuraman *et al.*, 1985; Stewart and Walsh, 1989; Gaster, 1990; Mattsson, 1993; Owlia and Aspinwall, 1996). Factor 5 (programmes issues) was also identified as an equally important dimension (Joseph and Joseph, 1997; Ford *et al.*, 1999). Finally, understanding (Factor 6) was considered important as determinant of service quality in a number of industries (Parasuraman *et al.*, 1985; Stewart and Walsh, 1989).

It is important to note that the six factors extracted did not conform with the famous SERVQUAL instrument, where five factors were identified, namely, responsiveness, reliability, empathy, assurance and tangibles – which were said to represent the generic dimensions of service quality (Parasuraman *et al.*, 1991a). Likewise, many subsequent studies of service quality in a variety of service industries have also failed to recover the five dimensions of service quality (see Buttle, 1996; Robinson, 1999).

Confirmatory factor analysis

According to Gerbing and Anderson (1988, p. 189), '. . . the construction of scales from an analysis of the size of the factor loadings does not provide an evaluation of the unidimensionality of these scales, as would be accomplished by a CFA in which each factor is antecedent to a mutually exclusive subset of indicators'. A highly mandatory condition for construct validity and reliability checking is the unidimensionality of the measure, which is referred to the existence of a single construct/trait underlying a set of measures (Hattie, 1985; Anderson and Gerbing, 1991). In order to check for unidimensionality, a measurement model is specified for each construct (factor/dimension) and CFA is run for all the constructs by means of structural equation modeling within LISREL framework (Joreskog and Sorbom, 1978). Specifically, LISREL

Table 1 Results of factor analysis (factor loadings)

Variables	Factor 1 Non-academic aspects	Factor 2 Academic aspects	Factor 3 Reputation	Factor 4 Access	Factor 5 Program issues	Factor 6 Understanding
1. Knowledgeable in course content		0.69				
2. Caring and courteous	0.34	0.73				
3. Responding to request for assistance		0.63				0.40
4. Sincere interest in solving problem		0.73				
5. Positive attitude		0.79				
6. Good communication		0.66				
7. Feedback on progress		0.62			0.37	
8. Sufficient and convenient consultation		0.59				
9. Professional appearance/image	0.34		0.50			
10. Hostel facilities and equipment			0.73			
11. Academic facilities	0.34		0.56		0.32	
12. Internal quality programmes			0.74			
13. Recreational facilities			0.77			
14. Minimal class sizes	0.36	0.33	0.38			–0.35
15. Variety of programmes/specializations					0.62	
16. Flexible syllabus and structure		0.31			0.71	
17. Ideal campus location/layout			0.46		0.32	0.40
18. Reputable academic programmes		0.31	0.48		0.38	
19. Educated and experience academicians	0.34	0.41	0.39		0.35	
20. Easily employable graduates	0.41	0.30	0.56			
21. Sincere interest in solving problem	0.77					
22. Caring and individualized attention	0.77					
23. Efficient/prompt dealing with complaints	0.73					
24. Responding to request for assistance	0.69					
25. Accurate and retrievable records	0.75					
26. Promises kept	0.80					
27. Convenient opening hours	0.69					
28. Positive attitude	0.74					
29. Good communication	0.75					
30. Knowledgeable of systems/procedures	0.64			0.39		
31. Feeling secured and confident	0.48	0.30		0.40	0.35	
32. Service within reasonable time frame	0.50		0.33	0.37	0.31	
33. Equal treatment and respect	0.44			0.57		
34. Fair amount of freedom				0.65		
35. Confidentiality of information	0.48			0.49		
36. Easily contacted by telephone	0.38			0.62		
37. Counseling services	0.35			0.49		0.40
38. Health services			0.51	0.31		0.40
39. Student's union	0.32			0.59		
40. Feedback for improvement			0.36	0.64		
41. Service delivery procedures	0.35	0.34	0.36	0.50		
Eigenvalues	8.28	5.53	4.85	4.27	2.55	1.26
Percentage of variance	20.2	13.5	11.8	10.4	6.2	3.1
Cummulative percentage of variance	20.2	33.7	45.5	55.9	62.1	65.2

Table 2 Unidimensionality for the six service quality constructs

Fit Indices	Dimension
Chi-square (χ^2)	2012.31
($P = 0.01$)	
Degree of freedom (d.f.) = 729	
Relative likelihood ratio (χ^2/d.f.)	2.76
Goodness-of-fit index	0.81
Adjusted goodness-of-fit index	0.77
Comparative fit index	0.98
Incremental fit index	0.98
Root mean squared error of approximation	0.07

8.3 (Scientific Software International, Chicago, IL) for Windows was used to analyse the underlying six-factor model where individual items in the model are examined to see how closely they represent the same construct.

Table 2 presents the measures of model fit for the entire sample, and the results indicated an acceptable fit for the six-factor model. The overall fit of the model to the data was evaluated in various ways. Specifically, an exact fit of a model is indicated when the P for χ^2 is above a certain value (usually set to $P > 0.05$) as well as indicated by other goodness-of-fit measures. While χ^2 is sensitive to sample size and tends to be significant in large samples, a relative likelihood ratio between a χ^2 and its degrees of freedom was used. According to Eisen *et al.* (1999), a relative likelihood ratio of 5 or less was considered an acceptable fit.

A number of goodness-of-fit measures were proposed to eliminate or reduce the dependence on sample size. LISREL 8.3 provides many fit indices of which the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), and the incremental fit index (IFI) were used. These indices have values ranging between 0 and 1, with higher values indicating a better fit. Table 2 shows the indices for all the six service quality constructs, and all the values are above 0.77, implying that there is an evidence of unidimensionality for the scales (Bryne, 1994). The root mean squared error of approximation (RMSEA), which is the measure of the discrepancy per degree of freedom, was also reported and the value of 0.07 indicated a fair fit to the data (RMSEA < 0.05 = close fit, RMSEA > 0.05 to <0.08 = fair fit, RMSEA > 0.08 to 0.10 = poor fit, Kelloway, 1998; Chow *et al.*, 2001). Therefore, it was concluded that the six-factor model fits well and represents a reasonably close approximation in the population.

Table 3 Reliability for the six service quality constructs

Dimensions	Cronbach alpha (α)	Split-half coefficient (r)
Non-academic aspects	0.96	0.97
Academic aspects	0.93	0.93
Reputation	0.93	0.94
Access	0.93	0.95
Programme issues	0.90	0.93
Understanding	0.73	0.74

Reliability analysis

The reliability of the composite score should be assessed after unidimensionality has been acceptably established. As Gerbing and Anderson (1988, p. 190) put it, '... even a perfectly unidimensional scale would be of little or no practical use if the resultant composite scores were determined primarily by measurement error, with the values of the scores widely fluctuating over repeated measurements'. Conceptually, reliability is defined as '... the degree to which measures are free from error and therefore yield consistent results' (Peter, 1979, p. 6).

In this study, two internal consistency estimates of reliability, namely, coefficient alpha and split-half coefficient expressed as Spearman–Brown corrected correlation were computed for the six service quality constructs. An alpha value of 0.70 and above is considered to be the criteria for demonstrating internal consistency of new scales and established scales respectively (Nunnally, 1988). For the split-half coefficient, each construct was split into two halves such that the two halves would be as equivalent as possible, and Cronbach's study in 1943 (cited in Wagner *et al.*, 1986, p. 108) stated that '... the split yielding the highest correlation ordinarily gives the most nearly comparable halves'. The values of both coefficient alpha and split-half coefficient for all the six scales are shown in Table 3. All the values meet the required prerequisite, thereby demonstrating that all the six constructs are internally

Table 4 Correlation matrix of service quality dimensions

Dimension	Non-academic aspects	Academic aspects	Reputation	Access	Programme issues	Understanding
Non-academic aspects	1.00	0.84	0.87	0.93	0.85	0.82
Academic aspects	0.84	1.00	0.85	0.79	0.90	0.81
Reputation	0.87	0.85	1.00	0.87	0.91	0.87
Access	0.93	0.79	0.87	1.00	0.83	0.85
Programme issues	0.85	0.90	0.90	0.83	1.00	0.81
Understanding	0.82	0.81	0.87	0.85	0.81	1.00

consistent and have satisfactory reliability values in their original form.

Validity test

Once unidimensionality is established and internal consistency estimates of reliability shows satisfactory values, the next step involves assessing the validity of the constructs. Validity is the extent to which a measure or set of measures correctly represents the concept of study. For the purpose of validating the six service quality constructs, the following validity tests, namely, face validity, content validity, convergent validity, discriminant validity and criterion-related validity were conducted. Given that the questionnaire had been appropriately designed through a comprehensive review of relevant literature then fined-tuned based on the suggestions from various experts, both the face and content validity of the instrument were ensured (Bohrnstedt, 1983; Kaplan and Sacuzzo, 1993). The primary threat to validity of the service quality measure used in this study is construct validity. Churchill (1979) suggests that convergent and discriminant validity should be assessed in investigating construct validity. All the six dimensions of service quality are correlated between each other, the results showed high correlations (see Table 4), indicating evidence of convergent validity.

Scales are tested for discriminant validity using a χ^2 difference test. In this test, all the discriminant validity checks on the six service quality constructs have been conducted. All the tests were statistically significant at the $P = 0.01$ level, thus indicating that all the six factors are distinct constructs, a strong indicator of discriminant validity. Criterion-related validity was also computed in order to check the performance of the measure against some criterion. In this research, criterion-related validity is established by correlating the constructs scores with three criteria, namely, service quality level, satisfaction level and loyalty. Table 5 indicates that all the constructs have a significant positive correlations with the overall service quality, satisfaction level and loyalty. Hence, criterion-related validity is established for all the six factors.

Table 5 Correlations among the six factors of service quality and the criteria

Dimension	Service quality level	Satisfaction level	Loyalty
Non-academic aspects	0.62	0.66	0.50
Academic aspects	0.56	0.62	0.50
Reputation	0.61	0.63	0.53
Access	0.65	0.67	0.52
Programme issues	0.58	0.63	0.51
Understanding	0.58	0.62	0.52

All correlations are statistically significant at 0.01 level.

Multiple regression analysis

Multiple regression was used in this study to determine the overall effect of the six dimensions on the service quality level, and to assess the relative importance of the individual dimensions.

The effect size

The regression model considered the service quality level as a dependent variable and the service quality scores for the individual dimensions as the independent variables. A multiple regression analysis was

Table 6 Relative importance of the six dimensions in predicting service quality level

Dimension	Standardized coefficients (β)	Significant (P)
Non-academic aspects	0.08	0.526
Academic aspects	0.04	0.701
Reputation	0.18	0.097
Access	0.39	0.001
Programme issues	–0.02	0.832
Understanding	0.02	0.789

subsequently conducted to evaluate how well the six dimensions predicted service quality. The linear combination of the six dimensions was significantly related to the service quality level, $R^2 = 0.43$, adjusted $R^2 = 0.42$, F (6, 402) = 50.3, $P = 0.01$. The sample multiple correlation coefficient was 0.66, indicating that approximately 42.9% of the variance of the service quality level in the sample can be accounted for by the linear combination of the six dimensions.

The relative influence

There have been attempts to examine the relative influence of individual service quality dimensions in order to figure out which dimensions are important determinants of service quality based on customer perception (Parasuraman *et al.*, 1988, 1991b). Table 6 shows the results of the regression analysis where the dependent variable was service quality level measured on a scale ranging from 1 (very poor) to 7 (excellent). The resultant output had an adjusted R^2 of 0.42 ($P = 0.01$) and yielded only one significant dimension, namely, 'access'. It alone accounted for 15% ($0.39^2 = 0.15$) of the variance of the service quality level, while the other dimensions contribute only an additional 27.9% (42.9–15.0%). This implied that the dimensions 'non-academic aspects', 'academic aspects', 'reputation', 'programme issues' and 'understanding' did not contribute significantly towards explaining the variance in the overall rating.

Limitations and suggestions for future research

It is important that the findings of this empirical research be evaluated in the light of certain limitations since acknowledgement of these limitations could suggest new directions for future studies. The present study was conducted in a single service sector, namely, higher education, thus some of the results particularly the dimensions of service quality may be specific to the particular service setting. Some researchers argue that the approach may potentially raise concerns about lack of generalizability, but interestingly such technique also eliminates problems associated with the effects of industry differences.

Another limitation focuses on the measurement items in HEdPERF, which were entirely described in positively worded statements, and may lead to 'yea-saying'. It is normally considered good research practice to include both positively and negatively worded items (Churchill, 1979). However, such approach may have consequences for respondents who can make comprehension errors and take more time to read the 41-item questionnaire. Moreover, Babakus and Boller (1992) showed that the combined positively and negatively worded items in SERVQUAL tended to result in two separate 'method factors' and subsequently Parasuraman *et al.* (1991a) have reworded all their negatively worded items positively.

In terms of future research areas, it may be worthwhile to develop a measuring instrument from a different perspective that is from other customer groups, namely, internal customers, employers, government, parents and general public. Although in higher education students must now be considered 'primary customers' (Crawford, 1991), the industry generally has a number of complementary and contradictory customers. This study has concentrated on the student customer only, but it is recognized that education has other customer groups which must be satisfied.

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