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SERVICE QUALITY SATISFACTION OF PUBLIC BUS SERVICE: A STRUCTURAL EQUATION MODELING APPROACH

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ABSTRACT

The relationships between service quality and satisfaction of public bus service were investigated using structural equation modeling. Customers of a campus bus service were chosen to demonstrate the analysis. Service quality was operationalised along three dimensions, namely the bus itself, its driver and the service per se. The customers' satisfaction was evaluated in terms of voluntary use, service fee and overall service. The analysis found the existence of significant relationships and supported the notion that service quality influences satisfaction. Although not all dimensions of the service quality had a direct influence on the satisfaction level, the three dimensions of service quality were found to intertwine to achieve a combined effect.

Keywords*: service quality; customer satisfaction; structural equation modeling; public transport service.*

ABSTRAK

Hubungan antara kualiti perkhidmatan dan kepuasan bagi perkhidmatan bas awam telah disiasat dengan menggunakan pemodelan persamaan berstruktur. Pelanggan bagi satu perkhidmatan bas kampus telah dipilih untuk menunjukkan analisis tersebut. Kualiti perkhidmatan telah diterjemah dalam tiga dimensi, iaitu bas sendiri, pemandunya dan perkhidmatan per se. Kepuasan pelanggan telah dinilai berdasarkan penggunaan sukarela, yuran perkhidmatan dan perkhidmatan keseluruhan. Analisis mendapati wujudnya hubungan nyata dan menyokong tanggapan bahawa kualiti perkhidmatan mempengaruhi kepuasan. Sungguhpun tidak semua dimensi kualiti perkhidmatan mempunyai pengaruh secara langsung ke atas paras kepuasan, ketiga-tiga dimensi kualiti perkhidmatan tersebut didapati berhubung kait untuk mencapai satu kesan bergabung.

INTRODUCTION

Organisations, faced with increasing global competition and sophisticated customers, have in recent years singled out various quality initiatives to enhance their competitiveness (Tan & Sia, 2001; Rahman, 2001). The term quality has been defined in many ways (Rowe & Neal, 1993). However, the one that captures the current thinking in business, defines quality as "conformance to customer specifications" (Parasuraman, Zeithaml, & Berry 1988). Quality is meeting the criteria that the customers establish. Therefore, to achieve this type of quality, one has to know who one's customers are and what they want.

Over the years, service quality has become an area of interest in marketing research (e.g. Lee, Lee & Yoo, 2000; Chen & Ting, 2002). However, according to Andreassen (1995), most of the work on the marketing of services revolved around private profit-seeking organisations. The founded theories were then automatically translated to public services. However, the fact that the public sector differs from the private sector in that the authority processes, structures, and functions vary greatly has been neglected. In addition, the objectives of the public sector are less clear, clients and stakeholders are more diverse and numerous, and concepts such as quality are more complex.

The purpose of the study described in this paper is to propose and test a structural equation model that can be used to determine the quality sought for and to measure customer satisfaction in the case of public transportation in a university campus. Section 2 presents a testable structural model of the quality-satisfaction framework. Section 3 presents the research methodology and discusses the survey instrument. The results of the model testing are covered in Section 4 and finally the conclusions and managerial implications are put forward in Section 5.

RESEARCH FRAMEWORK

Quality usually is not determined by a single attribute or dimension of a product or service. In their landmark study, Parasuraman, Zeithaml and Berry (1985) identified ten dimensions of service quality: reliability, responsiveness, competence, accessibility, courtesy, communication, credibility, security, understanding and tangibles. They subsequently reduced the ten dimensions into five specific components by factor-analysing the original 22-item scale: tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman *et al.*,1988). The

study has since become the basis for many studies on service quality (e.g. Cronin & Taylor, 1992; Lee *et al*., 2000; Chen & Ting, 2002; Ham, Johnson, Weistein, Plank & Johnson, 2003) even though there are scholars such as Carman (1990), and Babakus and Boller (1992) who maintain that the dimensionality of service quality depends on the type of services under study. Brady and Cronin (2001), on the other hand, stress that the evaluation of the customer on the service received happens at many stages and all these evaluations are aggregated to become the overall measurement of service performance.

The framework of this study was developed based on the original work done by Parasuraman, Zeitham and Berry (1985) because of its specificity. It also drew upon the findings of Woodside, Frey and Daly (1989), Cronin and Taylor (1992), Andreassen (1995), and Burton, Sheather and Roberts (2003) and proposed a path diagram as depicted in Figure 1. Past studies were referred to determine the direction of the causality between satisfaction and service quality. There were researchers who supported the argument that customer satisfaction leads to service quality (e.g. Bitner, 1990; Bolton & Drew, 1991). On the other hand, other researchers such as Cronin and Taylor (1992), Spreng and MacKoy (1996), and Chen and Ting (2002) empirically supported the notion that service quality influences satisfaction. There appears to be no consensus regarding the causal direction between the two constructs. However, based on personal experience, we tend to believe that customers can evaluate an object or service only after they have interpreted or consumed the object or service, thus Figure 1 would be used for the structural modeling.

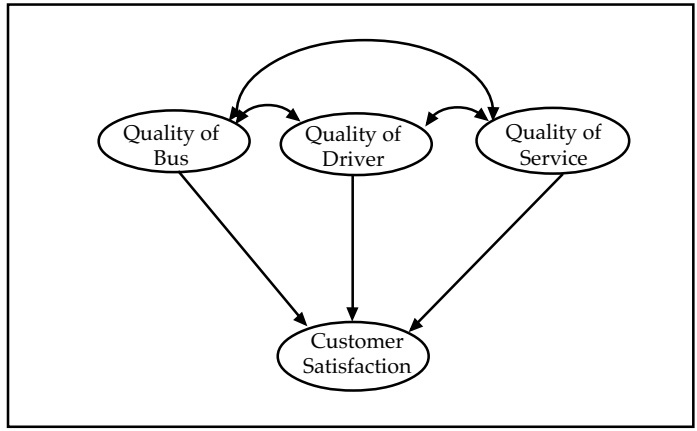

Figure 1
Service quality and satisfaction model

RESEARCH METHODOLOGY

Measurement

Service Quality

Numerous past studies on the relations of service quality and customer satisfaction have identified various service quality dimensions that may affect customer satisfaction (Oliver, 1989, 1993; Parasuraman *et al.*, 1985; Grönroos, 1984; Andreassen, 1995; Lee *et al*., 2000; Chen & Ting, 2002). Parasuraman *et al.* (1985) proposed ten dimensions of service quality and all these dimensions have been tested and confirmed as suitable for use as a framework to measure service quality (Weng, 1996; Lee *et al.*, 2000; Chen & Ting, 2002).

When discussing their research framework, Woodside *et al.* (1989) argue that the SERVQUAL measurement scale has "experience properties" that can be known only as the customer is consuming or experiencing the service. As such, the key scenes, acts, and sequencing of acts must be mapped out in detail. Customer service quality judgments must be measured for each act occurring in the service encounter. In addition, the overall customer satisfaction with the service is a function of the satisfaction with and service quality of the several acts perceived by the customer for the encounter. This study, therefore, investigates the dimensions of service quality from three aspects as shown in Figure 1. The ten dimensions are re-grouped as in Table 1. Twenty items were constructed to operationalise the concept of the ten dimensions of service quality. Each item was measured using a 10-point scale with 1 representing very bad and 10 representing excellent quality.

Table 1
Exogenous Variables

Group of exogenous variables	Dimensions
Quality of bus	Tangibles
Quality of driver	Responsiveness, competence, credibility, courtesy, communication, understanding the customer
Quality of service	Reliability, security, accessibility

Customer Satisfaction

Customer satisfaction of the bus service was examined in three aspects, namely overall service satisfaction, voluntary use of the bus service, and fee or price of the service rendered. Here, the behavioral intention of reuse as in Cronin and Taylor (1992) and Woodside *et al*. (1989) was not deemed suitable as the use of the bus service in this study was compulsory due to the absence of alternatives. As such, instead of gauging the intention of reuse among the campus bus users who were required to use only the bus service available, a voluntary use would be more appropriate in this study. The perceived price or value was included as it was found to be significantly related to customer satisfaction (Ismail & Khatibi, 2004). The items were also measured on a 10-point scale anchored with "strongly disagree" and "strongly agree".

Target Population

Universiti Utara Malaysia (UUM) is one of the few universities in Malaysia that provides full on campus accommodation for all its undergraduate students. There are fourteen residential colleges scattered around 1 061 hectares of land that house more than twenty thousand fulltime students. Students depend on good transportation to attend lectures and other academic activities. As such, many students opt for their own transport. This has resulted in many traffic and parking problems. Since 2002 UUM has introduced the round-campus bus service with the aim of reducing traffic congestion on the campus. The use of the service is compulsory for all UUM students. These fulltime undergraduates are the target population of the study.

Data Collection

Once an initial measurement of service quality and customer satisfaction had been developed, pretesting was carried out to ensure the instrument's content validity. For this purpose, five students were randomly approached for a face-to-face interview. The emphasis was on the completeness and precision of the measurement as well as clarity of terms and instruction. Next, a sample of 50 students was selected through convenient sampling for the purpose of pilot testing. Cronbach's alpha for the constructs of service quality and customer satisfaction was above 80% indicating a good reliability. Construct validity of the measurement was demonstrated by the significant correlations between each of the 20 items of service quality and the single question on the overall service quality, and also the significant correlations among the three items of customer satisfaction.

In the process of data collection, a sample of 500 students was selected among the twenty thousand full-time undergraduates in UUM. The random stratified sampling technique was used to ensure all users of the various routes of the campus bus service were represented. The number of students in each stratum was determined proportionally according to the number of students in the residential colleges on the bus routes. Table 2 shows the strata involved and the responses received.

Table 2
Samples and Response Rates

Route	No. distributed	No. returned	Rate of returned
A	160	143	89.4
B	220	182	82.7
C	90	86	95.6
D	30	28	93.3
Missing value	-	23	-
Total	500	462	92.4

To ensure the absence of non-response bias and the representativeness of the responses, certain known characteristics of the population and the respondents were compared. The distributions of the two groups in terms of gender and race were consistent indicating that the responses received were representative of the target population.

Data Analysis

Structural equation modeling (SEM) was used to determine the causal relationships among the variables as proposed in Figure 1. SEM is a multivariate technique which combines aspects of multiple regression (examining dependence relationships) and factor analysis (representing unmeasured concepts with multiple variables) to estimate a series of interrelated dependence relationships simultaneously (Hair, Anderson, Tatham & Black, 1998). It is, therefore, the most suitable analysis for this study to estimate the strength of causal and effect relationships.

ANALYSIS AND RESULTS

James, Mulaik and Brett (1982) proposed a two-step approach to developing structural equation models (SEM). The first step involves developing measurement models. This is done by assessing the construct validity of the observed measures. The second step is to define the structural model specifying relations among the latent variables.

Measurement Models

Measurement models for each latent variable were developed using SPSS and AMOS software (Figures 2a, 2b, 2c and 2d). Initially, reliability analysis was conducted for the 20-item service quality construct. The Cronbach's alpha was 0.90. Then, exploratory factor analysis using principal components extraction was performed. However, before factor analysis was conducted, the 20 items were examined for the suitability of the treatment. The overall Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) for the 20-item construct was 0.90. A closer examination of the individual item revealed that all items had a MSA above 0.80 except two items (less than 0.60) which were subsequently discarded (Hair *et al.*, 1998). The principal component extraction yielded three factors. Recalculation of reliability analysis produced the Cronbach's alpha of 0.90. A check on the item-total correlations found that four out of the 18 items had a correlation of less than 0.5. The four items were eliminated resulting in a 14-item service quality construct. Lastly, confirmatory factor analysis with varimax rotation was performed on the 14-item construct. Three factors, namely bus (Figure 2a), driver (Figure 2b) and service (Figure 2c), which adequately represented the three hypothesized latent variables were extracted (variance extracted = 71.9%).

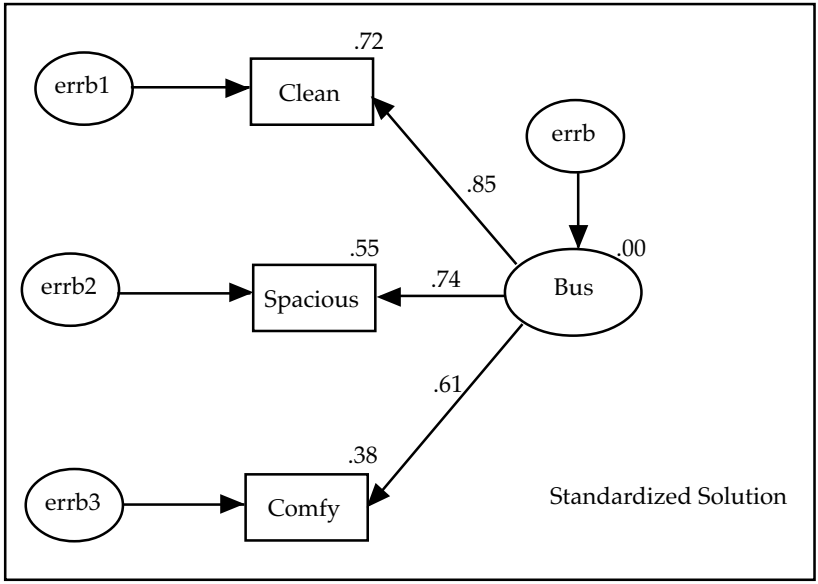

Figure 2a
Measurement model: Quality of bus

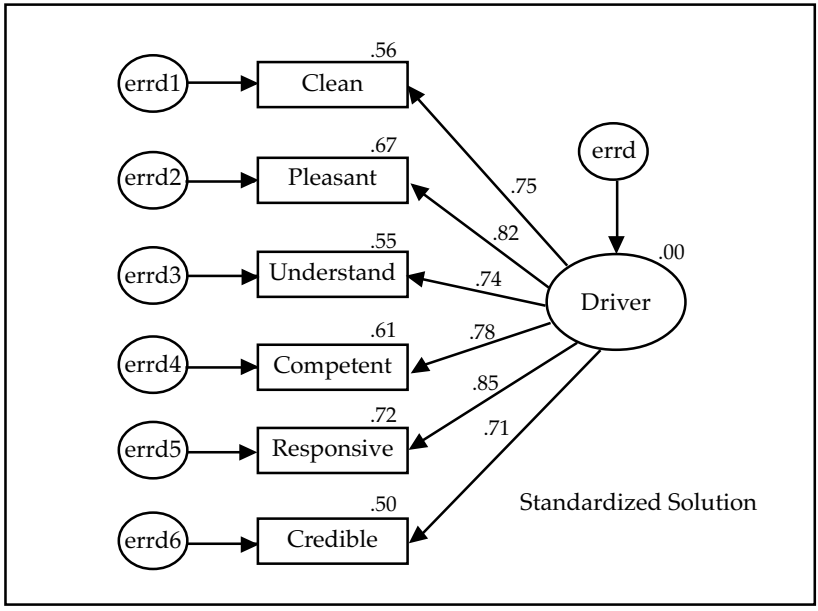

Figure 2b
Measurement model: Quality of driver

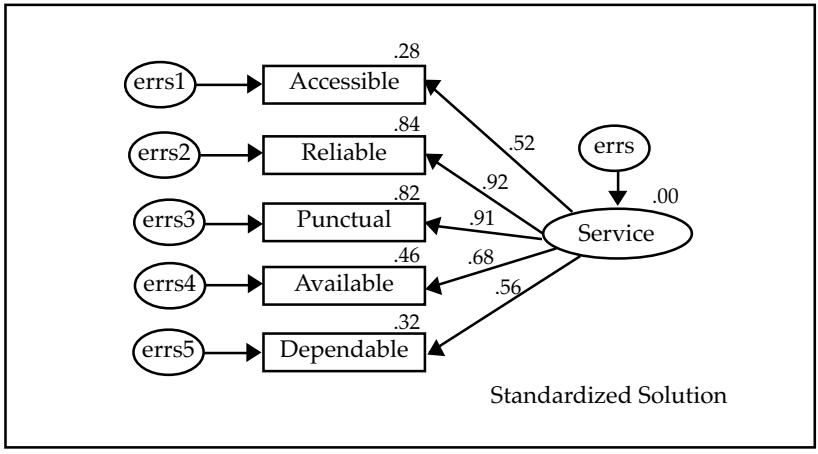

Figure 2c
Measurement model: Quality of service

Each latent variable was assessed by at least three observed variables (Figures 2a, 2b and 2c). Reliability of each latent variable was assessed by calculating the Cronbach's alpha and the variance extracted value.

The respective values for the three latent variables were: bus (0.77, 69.0), driver (0.90, 66.7) and service (0.87, 79.0). Relationships between the observed variables and the corresponding latent variables are described by factor loadings (all above 0.67) which serve as a validity coefficient (Hair *et al.*, 1998).

The customer satisfaction variable was measured using three observed variables. The Cronbach's alpha and the variance extracted are 0.70 and 62.3 respectively. All the observed variables have factor loading of 0.70 or above. Figure 2d shows the observed variables that adequately measure the hypothesized latent variable.

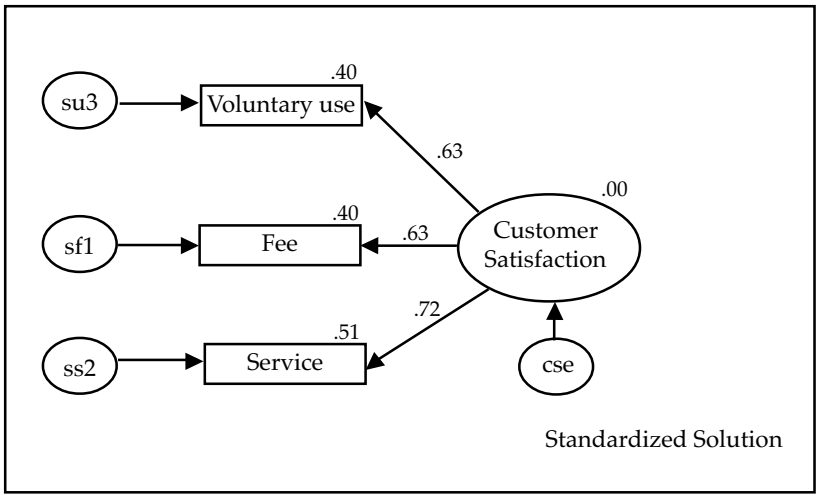

Figure 2d
Measurement model: Customer satisfaction

A sample size of 191 students, randomly selected from the 462 respondents, was used in model estimation to ensure the size fell within the acceptable limits for use of SEM (Hair *et al*., 1998). Hair *et al.* (1998) recommend a sample size of 200 because as the sample size becomes larger, all goodness-of-fit measures become "too sensitive" and almost any difference is detected, indicating poor fit.

Structural Equation Models

The validity of the measurement models allow for the structural model specified in Figure 1 to be evaluated. The resulting structural equation model is shown in Figure 3 as the initial model.

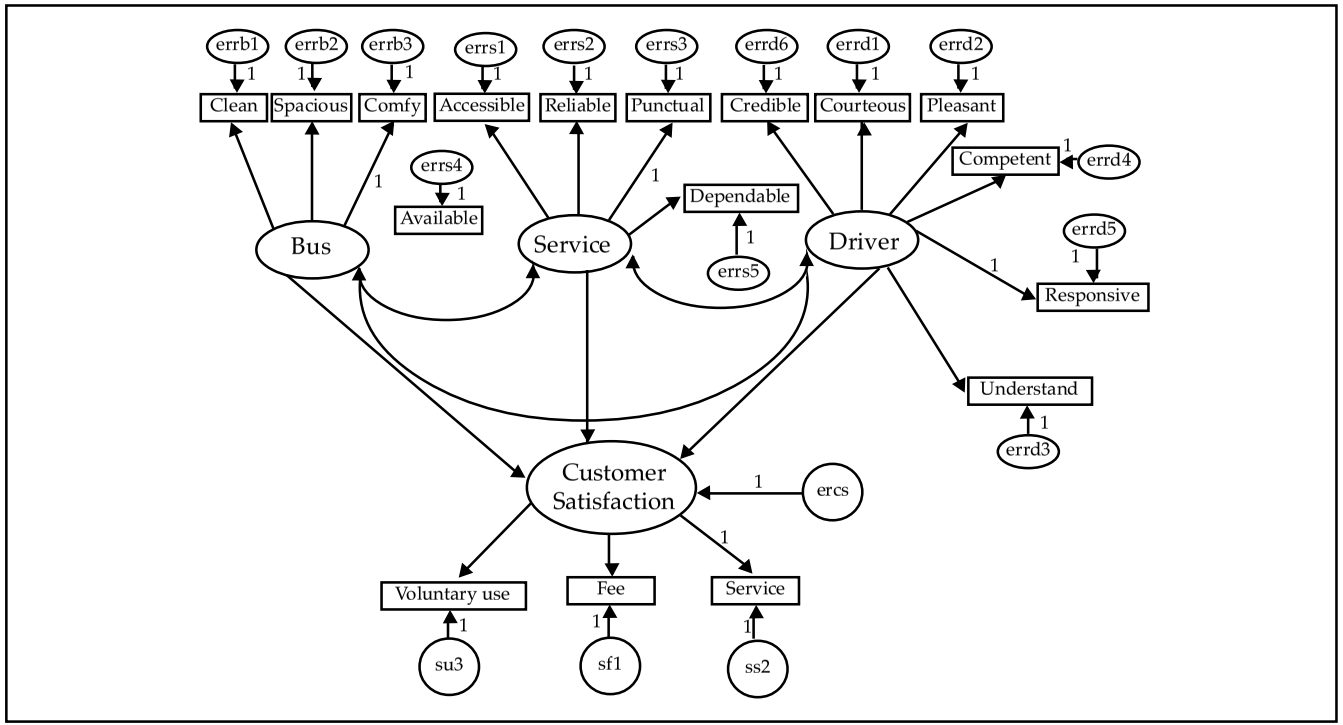

Figure 3
Initial structural equation model

Several measures of goodness-of-fit were evaluated for the structural model: χ^2, χ^2/degree of freedom, goodness-of-fit index (GFI), normed fix index (NFI), Tucker-Lewis index (TLI), comparative fix index (CFI) and root mean square error of approximation (RMSEA) (Hair *et al*.,1998). Details are presented in Table 3.

Before evaluating the structural model, an initial inspection for "offending estimates" was performed. The path linking bus quality with customer satisfaction (β = -0.01) was not statistically significant (at $\alpha = 0.05$) and was subsequently removed. This resulted in the model shown in Figure 4. The statistically significant ($\alpha < 0.05$) direct effects, i.e. the standardized regression coefficients, are shown on the one-way arrows and the correlations are shown on the two-way arrows.

Table 3
Goodness-of-fit measures

Model	χ^2	d.f	χ^2/d.f.	GFI	NFI	TLI	CFI	RMSEA
Initial (Fig. 3)	289.61	113	2.56	0.85	0.84	0.87	0.89	0.09
Final (Fig. 4)	262.24	113	2.321	0.86	0.85	0.89	0.91	0.08
Recommended good fit value			≤3.0	≥0.90	≥0.90	≥0.90	≥0.90	≤0.08

The overall model fit is marginal with the values of GFI, NFI, TLI, CFI and RMSEA all at marginal acceptable levels, and the value of χ^2/d.f. less than 3 (Table 3). The likelihood-ratio chi-square (χ^2) value of 262.24 with 113 degrees of freedom is statistically significant at the 0.01 significance level. It may be concluded that significant differences exist between the estimated model and a baseline or null model. However, bearing in mind that the chi-square test becomes more sensitive as the number of indicators and sample size increase, a number of other measures were examined. The GFI value of 0.86 is at a marginally acceptable level, but the RMSEA has a value which falls inside the acceptable range of 0.08. According to Hair *et al.* (1998), RMSEA is best suited for large samples. 'The value is representative of the goodness-of-fit that could be expected if the model were estimated in the population, not just the sample drawn for the estimation.' (Hair *et al.* 1998).

Even though only marginal support was found for the final model, it was sufficient to proceed and examine the estimated coefficients for practical implications. Figure 4 reveals that for the causal relationship linking the three evaluative dimensions with customer satisfaction, only two dimensions, i.e. the service → customer satisfaction

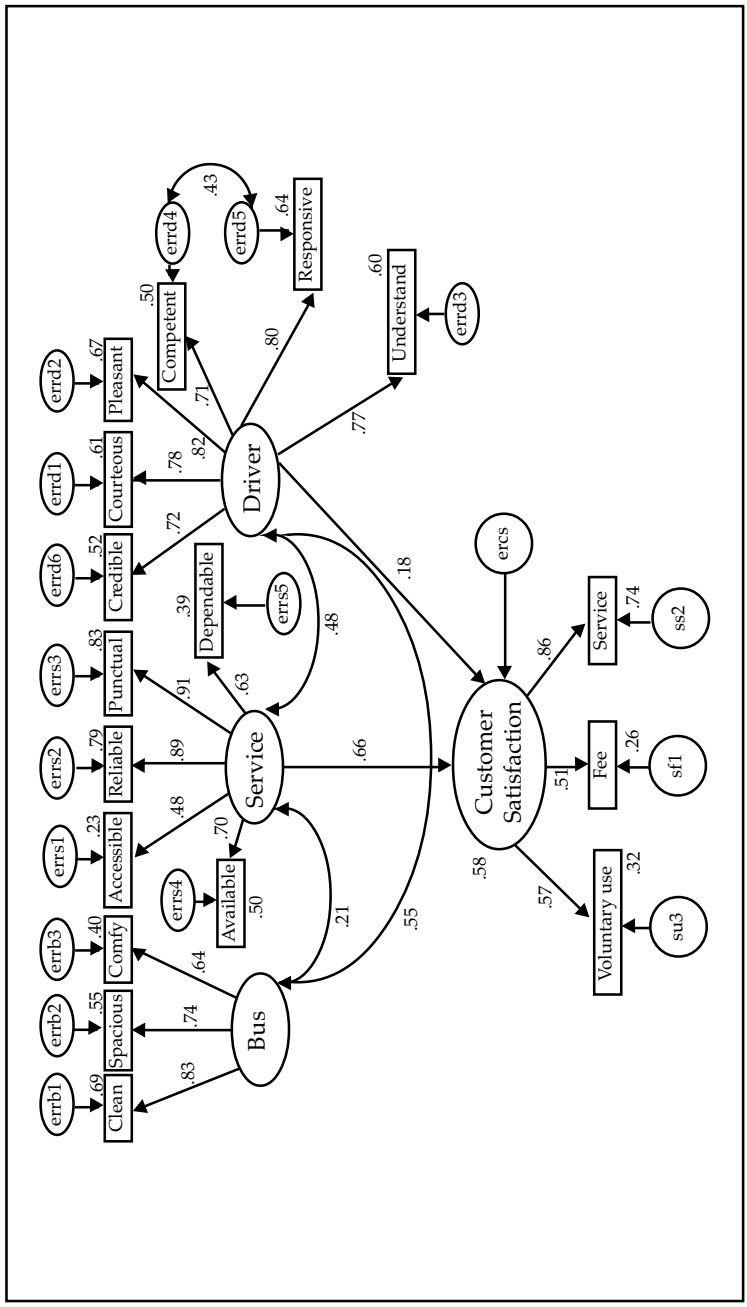

Figure 4
Final stuctural equation model

(standardized regression coefficient = 0.66) and the driver → customer satisfaction (standardized regression coefficient = 0.18) relationships are statistically significant. This means that the bus service per se is the most important and has a direct influence in satisfying customers. Therefore, in order to fulfill customer satisfaction for the campus bus service, the service provider should emphasise on the maintenance of the existing service quality and the development of new ones focusing on these features. A reliable and punctual bus service is an important quality feature that affects satisfaction. However, the service provider should not ignore the other aspects of service quality because the three dimensions of quality are interwoven as revealed in the correlations between the dimensions. The combined effect of these three dimensions achieves an R^2 value of 58% of the variance in customer satisfaction.

CONCLUSIONS AND MANAGERIAL IMPLICATIONS

This study provides empirical evidence to support the notion that service quality influences satisfaction (e.g. Spreng & Mackoy, 1996; Chen & Ting, 2002). Although not all dimensions of service quality have a direct influence on the satisfaction level, the three dimensions of quality are found to intertwine to achieve a combined effect. As such, the management of the campus bus service must not ignore any dimension of the service quality if they want to meet customer satisfaction. As the campus bus service has the public transportation characteristics where the students have no option but to use the service, it is not surprising that the bus quality has no direct effect on satisfaction. In fact, for these students, the punctuality and reliability of the service dimension per se are deemed most important in assessing their satisfaction.

We believe that a public transportation system which adequately provides customer satisfaction will negate the need to make this service mandatory and customers will be more inclined to use this mode of transportation rather than resorting to their own means of transport. This in turn will help to ease traffic congestion in the campus.

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