



Measuring customer satisfaction of FM service in housing sector

A structural equation model approach

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Abstract

Purpose – The purpose of this paper is to identify and analyze crucial variables of customer satisfaction towards residential facility management (FM) service, and to enable FM companies to deliver high quality services.

Design/methodology/approach – The research is based on a survey of customer satisfaction of one residential property in Hong Kong. FM service is divided into two interrelated clusters which are denoted by two latent variables, and then a specific structural equation model is developed for identifying and quantifying the influence of service and management quality on customer satisfaction and clarifying the causal relationships between these latent and observed variables.

Findings – The research reveals that: both service and management quality have significant positive effect on customer satisfaction, and the effect of service quality is larger than that of management quality when the indirect effect is taken into account; service quality is a crucial latent variable influencing customer satisfaction and it has a significant direct effect on management quality; how the individual observed variables work together to characterize the corresponding latent variables from an empirical point of view, and some key variables that should be focused on by facility managers in the housing sector are also identified.

Practical implications – Structural equation models are advocated for evaluating customer satisfaction in the housing property sector of facility management service. It can also be used in other sectors of facility management, such as office, retail property or some public property management like hospitals and schools. It has implications for facility management managers in how to improve residential customers' satisfaction level.

Originality/value – This paper presents a quantitative model of characterizing the degree of customer satisfaction.

Keywords Customer satisfaction, Residential property, China, Linear structure equation modelling, Housing

Paper type Research paper

Introduction

Facility management (FM) is a relatively new profession, which has gradually gained a foothold as a discipline and profession within the property industry (Tay and Ooi, 2001; Ventovuori *et al.*, 2007) in recent years. This profession aims to provide high-quality and cost-effective service to in-house customers in support of corporate business plan (Rondeau *et al.*, 2006).

It is widely accepted that the customer (client) plays an important role in many industries, especially in service business[1]. As noted by Boyd and Chinyio (2006) for



construction industry, clients are the reason that industry exist, hence the industry should try to understand clients' need and fulfill clients' satisfaction. What they focus on is a better engagement between the industry and its clients. On the other hand, empirical analyses on the satisfaction of facility management service (FMS) have traditionally focused on the service fee or the competitive position of the facilities management (FM) supplier, whilst neglecting the unique needs of its customer (Shaw and Haynes, 2004). This may lead FM in danger of becoming simply a commodity service bought at the lowest price from a range of non-differentiated suppliers (Loch, 2000). As Shaw and Haynes (2004) argue, FM should develop models that are more sensitive to the needs of the customer and support the customer in meeting their core objectives. Customer satisfaction and loyalty, as a consequence of high quality, provides long-term survival and success (Robledo, 2001). Customer satisfaction and appreciation are becoming the key issues of FMS in a highly competitive market. Hence, customers' expectations and perceptions have attracted considerably high attention of both researchers and FM practitioners. Besides, this research area is still going on in different areas of service industry. (Please refer to Choi and Chu (2001); Ekinci *et al.*, 2003; Kim and Oh, 2004 for examples in hotel industry service), especially in conceptualization and measurement of customers' viewpoint (see Atilgan *et al.*, 2008). Self-assessment of FMS satisfaction is a potential and popular method to reflect how customers value the whole package of FMS delivery according to their own personal appreciations, expectations and critical criteria. Therefore, customer satisfaction may serve as an efficient vehicle to evaluate and reflect the performance of FM staff and the management of facilities.

On the other hand, both households and tenants would like their buildings to become more attractive, comfortable, safe and harmonious as well as cost efficient. These intensified requirements, to some extent, have increased the relative importance of customer satisfaction in the success of FM. These demands also require the FM companies to monitor the effect and progress of their service.

Keeping these in mind, we attempt to conduct a questionnaire survey and analyze the factors that are crucial in characterizing the degree of customer satisfaction. For this purpose, we use a structural equation model to identify several latent variables such as service quality, management quality of FMS, and investigate interrelationships between latent variables and observed variables obtained from the survey. Furthermore, the study delivers some measures to help FM companies increase satisfaction degree of residential FMS.

The rest of the paper is organized as follows. The next section summarizes earlier research on customer satisfaction and its determinants in FMS; the third section gives a brief account of structural equation mode; the fourth section describes the data set, the choice of variables, and the measurement and structural models; the fifth section discusses the estimation results; and the last section concludes.

Summary of recent research on customer satisfaction of FMS

Customer satisfaction has been defined in various ways (Fornell, 1992; Kotler, 2000; please refer to Lin, 2003 for a survey). Besides, the definition of customer satisfaction is an ambiguous and abstract concept, which varies from industry to industry. In this study, we adopt one of the widely accepted definitions that "satisfaction is a post-choice evaluative judgment of a specific transaction, which can be viewed directly

as an overall feeling, best specified as a function of perceived quality” (see Parasuraman *et al.*, 1985; Bastos and Gallego, 2008), which seems more adapted to FM. Service quality is another focus of research efforts (Parasuraman *et al.*, 1988, 1991, 1993; Cronin and Taylor, 1992; etc.). In general, service quality is captured with perceptions model (e.g. Cronin and Taylor, 1992), or captured with disconfirmation model (e.g. Parasuraman *et al.*, 1994). Distinguishing with goods quality, which can be measured objectively by some tangible indicators like durability and number of defects (Crosby, 1979), service quality is much more abstract and hard to assess intuitively (Parasuraman *et al.*, 1985).

Customers are now becoming increasingly conscious of their rights and are demanding higher quality service, and customer satisfaction is one of the direct indicators evaluating the efficiency and quality of service delivered by FM companies. Therefore, customer satisfaction has become one of the major determinants of FMS in today’s competitive market. The reason is straightforward that their objective should be to have consumers who are satisfied with their performance or to deliver the maximum level of perceived service quality (see Bastos and Gallego, 2008). In this context, prioritization of preferences and close evaluation of customer satisfaction have become essential to FM companies. However, it is challenged to develop quality models for use in services have led to difficulties, mainly due to the intangibility of service provision (Bebko, 2000). Some previous researchers have put great efforts to fill this gap. Finch (2004) proposes that customer satisfaction with facilities is determined not only by technical performance, but also by “an intricate set of exchange processes”, such as effective communication and management of expectations. Campbell and Finch (2004) apply organizational justice theory to FM with the aim of increasing customer satisfaction with the service received. They focus on how to maintain customer satisfaction in the FM industry and the theoretical reasons why the proposed methods will be effective. Shaw and Haynes (2004) apply service quality theory to FM; they use factor analysis to establish basic underlying concepts or dimensions, and propose “gap” model which makes a comparison between service quality and the level of importance that customers place on each service dimension. The implications are that FM managers can use service dimensions to measure the qualitative elements of FM service provision. More recently, Tucker and Smith (2008) put a special insight into the importance of user perception in FM, they contend that user perceptions in FM can be analyzed through a two-fold approach: user perception through their input and functionalities in the workplace and their consequent application of workplace productivity; and user perception through strategic FM delivery and the achievement of customer satisfaction.

According to some previous research, service quality and customer satisfaction have different explanation (Parasuraman *et al.*, 1985; Cronin and Taylor, 1992; Taylor and Baker, 1994), because service quality is an attitude, and it is generally considered to be the customers’ overall evaluation of the service whereas customer satisfaction is often treated as a specific transaction measure (Bastos and Gallego, 2008). Nevertheless, it is generally accepted that service quality is one of the most crucial factors determining the customer satisfaction. Meanwhile, the expected positive relationship between customer satisfaction and service quality are documented in several literatures (see Fornell, 1992; Cronin and Taylor, 1992; Choi *et al.*, 2004; Snoj *et al.*, 2004 for examples). As Oh (1999) suggests that service quality is an antecedent to

customer value, this is also confirmed by Choi and Chu (2001) and Choi *et al.* (2004). Parasuraman *et al.* (1988) suggest that service quality is a multidimensional concept, which includes reliability; responsiveness, assurance, empathy and tangibles. As such, much effort and research has been devoted to measure customer satisfaction and improve service quality, in order to maintain customer loyalty and increase market share within a highly competitive market. SERVQUAL (developed by Parasuraman *et al.*, 1988) is one of the effective and stable models for measuring service quality (see Parasuraman *et al.*, 1991, 1993; Cronin and Taylor, 1992; Shaw and Haynes, 2004 for examples). According to the SERVQUAL model, customer assessments of service quality result from a comparison of service expectations with actual performance. The main idea is that service quality is a function of the different scores or gaps between expectations and perceptions.

Although these studies provide some insight into the performance of FMS, previous analyses have used traditional approaches to examine the relationship between a factor and the outcome after adjusting other variables. Furthermore, the methodologies used in the previous studies are mainly for a multiple regression analysis of survey data, which focused on measuring the effect directly observable on FMS or examining the individual impacts of a variety of influence factors on the effectiveness of FMS. However, these methodologies have ignored the mutual relation among the variable sets of the influence factors; meanwhile they cannot measure some latent variables that cannot be observed directly (such as service quality, performance). Structural equation model (SEM) can ideally suited to address the methodological limitations identified above. Hence, the use of SEM would be useful to clarify the effects of different factors on FMS satisfaction because it allows for consideration of the complex links among different factors. Our study intends to contribute the existing literature on the interrelationship among service quality, management quality and customer satisfaction in FMS industry. Specially, this paper focuses on the need of residential customers, and could have many implications for FM companies in how to meet customers' need and satisfaction.

A brief instruction of structural equation model

SEM was developed by Joereskog and Goldberger (1975) and Joereskog (1981) as an efficient tool to deal with errors occurs in variables, and has been widely applied in social psychology and sociology (see, e.g. Bentler and Weeks, 1980). Besides, a number of empirical studies reported the positive effects of applying the SEM paradigm in satisfaction and service quality (see Florit and Lladosa, 2007; Li *et al.*, 2008 for examples). SEM can be used to investigate interrelationships between two types of variables: observed and latent. Observed variables have data that can be directly measured by a researcher, for example numeric responses to a rating scale item on a questionnaire. Latent variables, on the other hand, are variables that are of interest to a researcher but are not directly observable. A full SEM can deal with measurement error in both endogenous and exogenous variables (also known as dependent variable and independent variable respectively), i.e. each exogenous or endogenous variable is in itself unobservable (latent), but can be imperfectly measured by a range of indicator variables. In general, SEM is a powerful technique for analysis of causal relationships among endogenous variables (namely the structural model in SEM), and between endogenous and exogenous variables (namely the measurement model in SEM). For

instance, SEM can give better estimates for bi-directional causal relationships without the bias inherent to ordinary least squares methods; SEM can give coefficients for direct (e.g. $a \Rightarrow b$), indirect (e.g. $a \Rightarrow b \Rightarrow c$), and total (direct plus indirect) effects of variables on each other (see Kline, 2005; Choo and Mokhtarian, 2007).

The basic SEM consists of two parts, namely:

- (1) the measurement model specifying the relationships between the latent variables and their constituent indicators and the SEM designating the causal relationships among the latent variables;
- (2) the structural component expresses relationships among the latent variables. SEM enables the development of a causal indicator model in which a latent theoretical construct of interest is represented by measure variables (please refer to Kline, 2005 for more specific details of SEM and its theory).

Data collection and description

The objective of this survey is to gauge the performance in terms of customer satisfaction of the FM service in Hong Kong, by a case study of one of the territory's biggest property and facilities management companies. The questionnaire was prepared and fine-tuned through discussions with various stakeholders, including property and facilities managers, property owners, and tenants. It was pilot-tested to verify the validity of the questions being used and gauge the likely feedbacks solicited from respondents. One of the largest estates in Hong Kong was randomly selected. On that estate, a full-scale survey was conducted covering all owners and tenants who use the FM service.

Customer satisfaction is a holistic and abstract process in terms of the perception of service delivered by FM Company. In order to catch this concept comprehensively, we designed a specific questionnaire which contained 25 questions, 22 specific questions about satisfaction level of the particular service provided by FM Company, and three demographic questions. Questions are rated on one to five-point scale (represents for very unsatisfactory, unsatisfactory, average, satisfactory and very satisfactory respectively) with the exception of Q23 to Q25. The data were collected during October and December 2008. A total of 6,648 self-administered questionnaires were sent to all households/tenants of one the largest private residential properties in Hong Kong[2]. Self-addressed business mail return envelopes were provided to the respondents for returning the completed questionnaires directly back to us. A total 1,366 of the questionnaires were completed and returned. The overall response rate is 20.55 percent, which is quite a good result for the postal administration method. After deleting those cases with missing data, we are left with 623 valid records. A total 92 percent of the households who responded to us are owners of their premises while the rest are lessees. The items of questionnaire are shown in Table I, including the mean, standard deviation, skewness and kurtosis of the observed variables. The bivariate correlations of these variables are illustrated in Tables II–III and Figure 1.

The demographic profiles of the respondents are shown in Figure 2, 53 percent of the residents were aged between 35-64 and 20 percent between 19-34. A total 44 percent of them have lived in their premises for 15 years or more whilst 22 percent have lived for 10-15 years.

| Latent variables | Questions (observed variables) | Mean | SD | Skew. | Kurt. |
|--|---|------|------|-------|-------|
| <i>Service quality (SQ)</i> | | | | | |
| Estate management officers and their services (EO) | Q1. Attitude and courtesy | 4.00 | 0.68 | -0.70 | 1.91 |
| | Q2. Professional knowledge | 3.63 | 0.74 | -0.34 | 0.65 |
| | Q3. Responsiveness to residents' requests | 3.69 | 0.80 | -0.63 | 1.04 |
| | Q4. Efficiency of complaint-handling | 3.61 | 0.89 | -0.52 | 0.35 |
| Security guards and their services (SG) | Q5. Attitude and courtesy | 3.96 | 0.71 | -0.60 | 1.29 |
| | Q6. Professional knowledge | 3.61 | 0.78 | -0.49 | 0.93 |
| | Q7. In-block security level | 3.64 | 0.82 | -0.46 | 0.53 |
| | Q8. Availability of SG when needed | 3.79 | 0.79 | -0.77 | 1.29 |
| Cleaning staff and their services (CS) | Q9. Attitude and courtesy | 3.93 | 0.73 | -0.57 | 0.82 |
| | Q10. Safety consciousness of CS at work | 3.74 | 0.71 | -0.54 | 0.95 |
| | Q11. Arrangements for refuse collection | 3.65 | 0.80 | -0.77 | 1.13 |
| | Q12. In-block cleanliness | 3.67 | 0.84 | -0.74 | 0.77 |
| <i>Management quality (MQ)</i> | | | | | |
| Management of utilities and communal facilities (CF) | Q13. Supply of flushing water | 3.88 | 0.72 | -0.89 | 2.06 |
| | Q14. Supply of electricity | 3.97 | 0.65 | -0.66 | 1.87 |
| | Q15. Operations of elevators | 3.47 | 0.92 | -0.59 | 0.19 |
| | Q16. Lighting of common areas | 3.76 | 0.71 | -0.69 | 1.40 |
| | Q17. Fire services equipment | 3.76 | 0.63 | -0.27 | 0.46 |
| Management of common areas outside blocks (CA) | Q18. Security level | 3.69 | 0.72 | -0.79 | 1.69 |
| | Q19. Cleanliness | 3.68 | 0.74 | -0.77 | 1.56 |
| | Q20. Lighting | 3.75 | 0.66 | -0.63 | 1.48 |
| | Q21. Repair and maintenance | 3.66 | 0.73 | -0.39 | 0.43 |
| | Q22. Overall customer satisfaction | 3.68 | 3.68 | 0.70 | -1.05 |

Table I.
Items of residential
customer satisfaction
survey

Empirical study

Model specification and hypothesis

This research examined the direct and indirect associations between service quality (comprising staff-related attributes), management quality (comprising facilities-related attributes) and customer satisfaction. The conceptual model that guided this research is shown in Figure 3. The observed variables are shown in rectangles while the unobserved latent variable constructs are shown in ellipses.

The arrows in the figure represent the direction of hypothesized influence. For instance, the influence of the Estate management officers and their services is presumed to be reflected in the observed measures of the four variables: Q1 to Q4; as depicted by the directional arrows. Specifically, we hypothesize that an increase in service quality would be directly associated with customer satisfaction. However, the direct relationship between them would be mediated by the services derived from estate officer, security guard cleaning staff and their service. We also hypothesize that the management quality would be directly associated with customer satisfaction and that this direct relationship would be mediated by management of communal facilities and common areas. Lastly, management quality is hypothesized to be influenced by a

Table II.
Matrix correlations
between observed
variables

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Q17 | Q18 | Q19 | Q20 | Q21 | Q22 |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| Q1 | 1 | | | | | | | | | | | | | | | | | | | | | |
| Q2 | 0.71 | 1 | | | | | | | | | | | | | | | | | | | | |
| Q3 | 0.64 | 0.69 | 1 | | | | | | | | | | | | | | | | | | | |
| Q4 | 0.54 | 0.59 | 0.79 | 1 | | | | | | | | | | | | | | | | | | |
| Q5 | 0.62 | 0.56 | 0.52 | 0.47 | 1 | | | | | | | | | | | | | | | | | |
| Q6 | 0.57 | 0.68 | 0.60 | 0.54 | 0.73 | 1 | | | | | | | | | | | | | | | | |
| Q7 | 0.46 | 0.52 | 0.62 | 0.68 | 0.60 | 0.68 | 1 | | | | | | | | | | | | | | | |
| Q8 | 0.50 | 0.49 | 0.52 | 0.42 | 0.52 | 0.59 | 0.64 | 0.60 | 1 | | | | | | | | | | | | | |
| Q9 | 0.49 | 0.45 | 0.38 | 0.34 | 0.54 | 0.48 | 0.44 | 0.43 | 1 | | | | | | | | | | | | | |
| Q10 | 0.49 | 0.52 | 0.42 | 0.39 | 0.53 | 0.55 | 0.48 | 0.47 | 0.70 | 1 | | | | | | | | | | | | |
| Q11 | 0.42 | 0.47 | 0.37 | 0.31 | 0.42 | 0.46 | 0.38 | 0.40 | 0.63 | 0.71 | 1 | | | | | | | | | | | |
| Q12 | 0.46 | 0.46 | 0.38 | 0.37 | 0.42 | 0.43 | 0.39 | 0.42 | 0.60 | 0.62 | 0.65 | 1 | | | | | | | | | | |
| Q13 | 0.30 | 0.33 | 0.30 | 0.34 | 0.32 | 0.34 | 0.35 | 0.32 | 0.25 | 0.30 | 0.29 | 0.26 | 1 | | | | | | | | | |
| Q14 | 0.35 | 0.34 | 0.35 | 0.35 | 0.37 | 0.34 | 0.38 | 0.41 | 0.29 | 0.33 | 0.31 | 0.29 | 0.71 | 1 | | | | | | | | |
| Q15 | 0.31 | 0.31 | 0.33 | 0.31 | 0.32 | 0.30 | 0.34 | 0.37 | 0.26 | 0.33 | 0.34 | 0.29 | 0.49 | 0.56 | 1 | | | | | | | |
| Q16 | 0.30 | 0.33 | 0.32 | 0.32 | 0.36 | 0.35 | 0.32 | 0.41 | 0.38 | 0.38 | 0.37 | 0.36 | 0.45 | 0.54 | 0.56 | 1 | | | | | | |
| Q17 | 0.33 | 0.36 | 0.36 | 0.36 | 0.37 | 0.38 | 0.40 | 0.44 | 0.37 | 0.41 | 0.37 | 0.39 | 0.53 | 0.57 | 0.53 | 0.71 | 1 | | | | | |
| Q18 | 0.42 | 0.46 | 0.43 | 0.42 | 0.52 | 0.59 | 0.49 | 0.65 | 0.43 | 0.47 | 0.42 | 0.44 | 0.41 | 0.48 | 0.40 | 0.50 | 0.54 | 1 | | | | |
| Q19 | 0.37 | 0.43 | 0.36 | 0.36 | 0.42 | 0.46 | 0.40 | 0.48 | 0.48 | 0.49 | 0.45 | 0.57 | 0.32 | 0.40 | 0.33 | 0.48 | 0.50 | 0.63 | 1 | | | |
| Q20 | 0.33 | 0.37 | 0.33 | 0.42 | 0.34 | 0.41 | 0.36 | 0.44 | 0.33 | 0.40 | 0.36 | 0.38 | 0.36 | 0.43 | 0.39 | 0.61 | 0.59 | 0.57 | 0.61 | 1 | | |
| Q21 | 0.35 | 0.41 | 0.38 | 0.36 | 0.34 | 0.39 | 0.34 | 0.43 | 0.31 | 0.37 | 0.35 | 0.42 | 0.41 | 0.45 | 0.44 | 0.55 | 0.59 | 0.56 | 0.58 | 0.65 | 1 | |
| Q22 | 0.56 | 0.55 | 0.57 | 0.51 | 0.55 | 0.57 | 0.53 | 0.57 | 0.43 | 0.51 | 0.45 | 0.49 | 0.42 | 0.50 | 0.46 | 0.49 | 0.52 | 0.57 | 0.59 | 0.48 | 0.51 | 1 |

Notes: All correlations are significant at the 0.01 level (two-tailed), $n = 623$

| | EO | SG | CS | SQ | CF | CA | MQ | Measuring customer satisfaction |
|-----|-------|-------|-------|-------|-------|-------|-------|---------------------------------|
| Q1 | 0.815 | | | 0.725 | | | | |
| Q2 | 0.863 | | | 0.767 | | | | |
| Q3 | 0.799 | | | 0.711 | | | | |
| Q4 | 0.695 | | | 0.618 | | | | |
| Q5 | | 0.811 | | 0.737 | | | | |
| Q6 | | 0.887 | | 0.806 | | | | |
| Q7 | | 0.754 | | 0.686 | | | | |
| Q8 | | 0.737 | | 0.670 | | | | |
| Q9 | | | 0.782 | 0.582 | | | | |
| Q10 | | | 0.883 | 0.657 | | | | |
| Q11 | | | 0.799 | 0.594 | | | | |
| Q12 | | | 0.766 | 0.570 | | | | |
| Q13 | | | | 0.390 | 0.631 | | 0.515 | |
| Q14 | | | | 0.418 | 0.677 | | 0.552 | |
| Q15 | | | | 0.432 | 0.699 | | 0.570 | |
| Q16 | | | | 0.500 | 0.810 | | 0.660 | |
| Q17 | | | | 0.532 | 0.861 | | 0.702 | |
| Q18 | | | | 0.572 | | 0.798 | 0.755 | |
| Q19 | | | | 0.559 | | 0.781 | 0.739 | |
| Q20 | | | | 0.514 | | 0.717 | 0.679 | |
| Q21 | | | | 0.512 | | 0.714 | 0.676 | |
| Q22 | | | | 0.743 | | | 0.481 | |
| EO | | | | 0.889 | | | | |
| SG | | | | 0.909 | | | | |
| CS | | | | 0.744 | | | | |
| CF | | | | 0.618 | | | 0.816 | |
| CF | | | | 0.618 | | | 0.816 | |
| MQ | | | | 0.757 | | | | |

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Notes: Total effect is the sum of direct effects and indirect effects

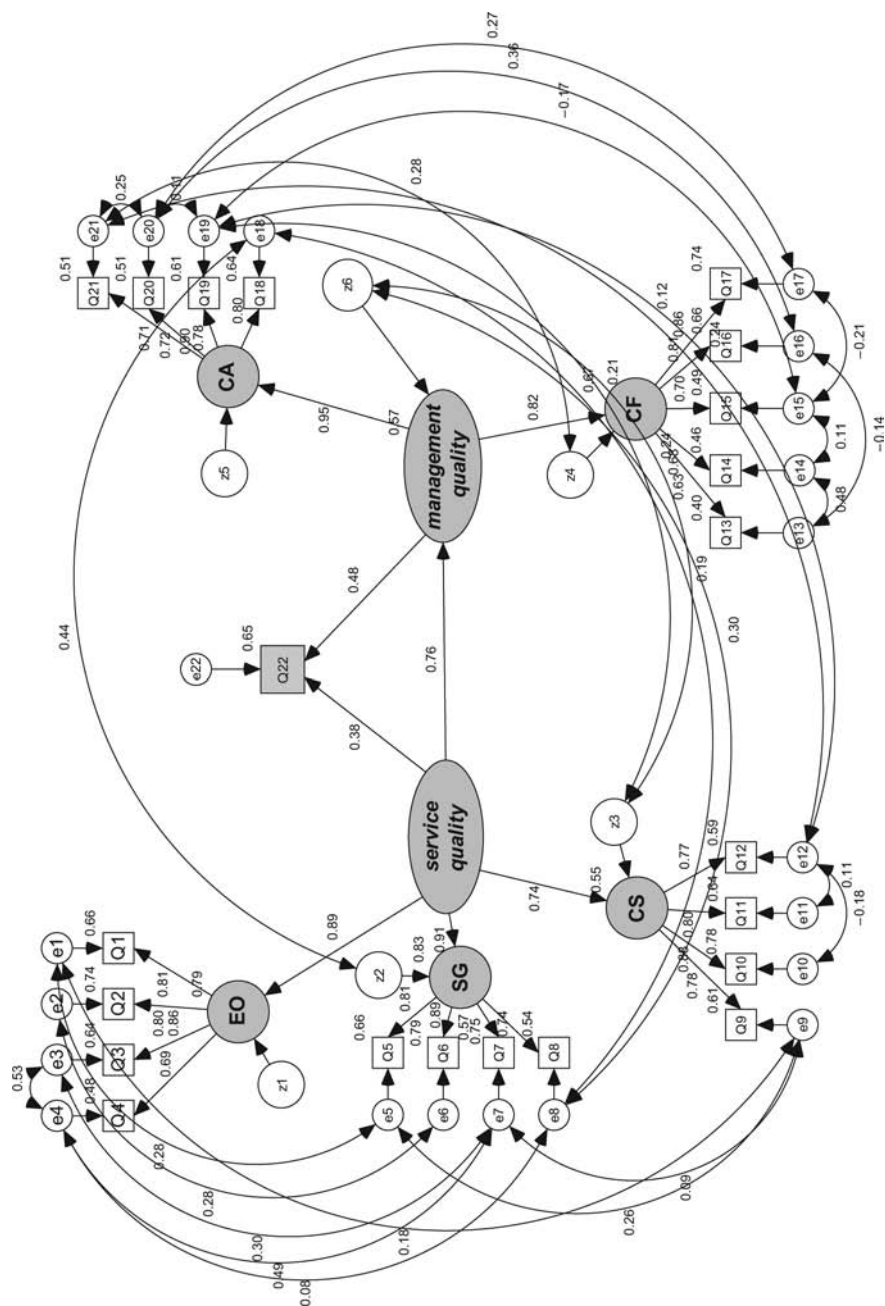
Table III.
Standardized total effects

combination of both latent endogenous (service quality) and latent exogenous variables, e management of communal facilities and common areas. As discussed above, we have three main hypothesises among service quality, management quality and customer satisfaction as follows:

- H1.* Service quality will have a direct positive effect on customer satisfaction.
- H2.* Management quality will have a direct positive effect on customer satisfaction.
- H3.* Service quality will have a direct positive on management quality.

Model results and discussion

We utilize the AMOS module of the SPSS software package (Arbuckle, 2006) to estimate the specific SEM in this study, and the estimations are based on the Maximum Likelihood Method. Table IV presents assessment measures of overall fit such as Chi-square, goodness of fit index (GFI), normed fit index (NFI) and comparative fit index (CFI). Generally speaking, the model has a moderate fit (all indices are greater than 0.95), although the χ^2 statistic (the smaller the better) is relatively high. However,



one rule of thumb for a good-fitting model is that the ratio of the χ^2 statistic to the degrees of freedom (df) be less than two (see Arbuckle, 2006 and Schermelleh-Engel *et al.*, 2003 for more details about the criteria). The ratio of the model is $280/174 = 1.6$, hence, the model is stable and converges properly.

The parameter estimates for the measurement model are presented in Table V. Standard errors for the parameter estimates are all reasonable (without any abnormal value). The *t*-values for all the parameter estimates are all statistically significant at the 0.1 percent level. The path coefficients for the influence of the observed variables on the latent variables are all positive as expected and range from 0.63 to 0.89 except the last two latent variables (i.e. SQ and MQ), which indicate that the selected observed variables extensively characterize their unobserved constructs. Hence, it can be inferred that the latent variable constructs are valid in the specific empirical setting shown in Figure 3. Figure 1 gives the standardized estimates of the direct effect between latent variables and observed variables.

This finding suggests that professional knowledge of staff (Q2 and Q6) has the most influence in characterizing the EO and SC service deliver (coefficient: 0.863 and 0.887 respectively), whilst Safety consciousness of CS at work (Q10) enabled CS to deliver services of the highest quality (coefficient: 0.883). Meanwhile, for the management

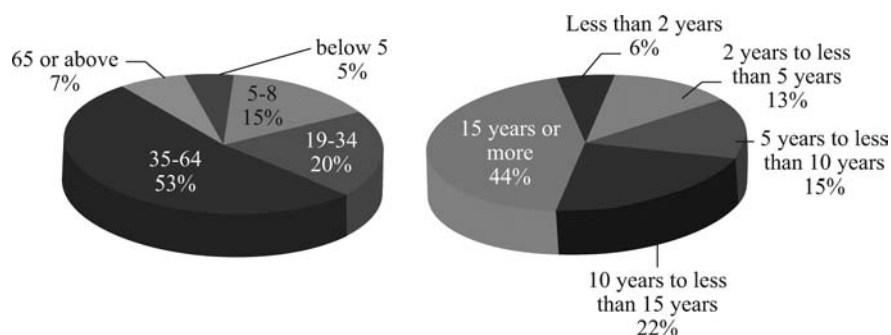


Figure 2.
Demographic profiles
responded households

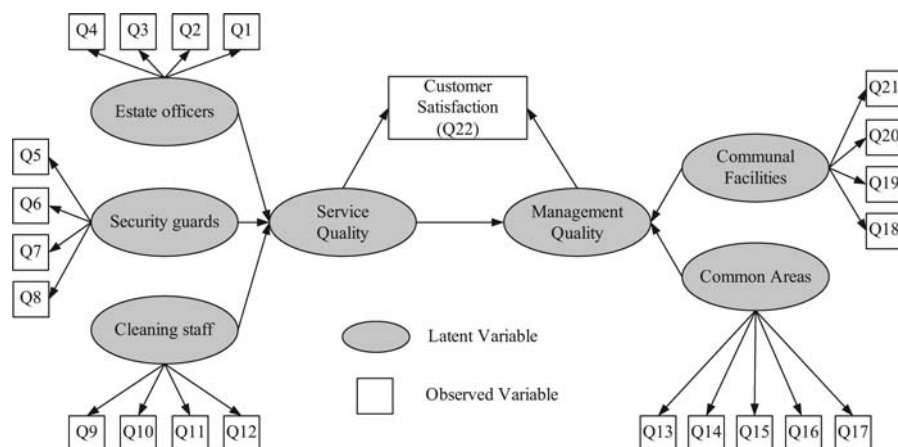


Figure 3.
Specification of SEM for
customer satisfaction
survey

sector, fire services equipment (Q17) is most correlative to the satisfaction level of CF (coefficient: 0.861), while security level (Q18, coefficient: 0.798) is the most concerned problem of residents according to the path coefficients.

Figure 4 shows the parameter estimates for the structural model. The path coefficients are all statistically significant at the 0.1 percent level. Hence, all three hypotheses are strongly supported by the empirical data. The hypothesis that a higher level of service quality leads to a higher level of management quality is confirmed in the structural model with a high positive parameter estimate (coefficient: 0.76). More specifically, when the score of service quality goes up by 1 standard deviation, customer satisfaction goes up by 0.74 standard deviations (0.74 is a total effect, which is due to both direct and indirect effects of service quality on Q22, please refer to

Table IV.
Overall evaluations of the
SEM results

| Model fit measures | Good fit | Empirical results |
|--------------------|------------------------------------|-------------------|
| χ^2/df | $0 \leq (\chi^2/\text{df}) \leq 2$ | 1.609 |
| GFI | Closer to one the better | 0.962 |
| NFI | $0.95 < \text{NFI} \leq 1$ | 0.971 |
| CFI | $0.97 < \text{CFI} \leq 1$ | 0.989 |

Notes: Adapted from Schermelleh-Engel *et al.* (2003)

Table V.
Parameter estimates of
measurement model
(relations of indicator
variables to latent
variables)

| Latent variables | Indicators | Factor loadings | Standard error | <i>p</i> -value | Path coefficients |
|------------------|------------|-----------------|----------------|-----------------|-------------------|
| <i>EO</i> | Q1 | 0.908 | 0.049 | * | 0.815 |
| | Q2 | 1.045 | 0.054 | * | 0.863 |
| | Q3 | 1.044 | 0.040 | * | 0.799 |
| | Q4 | 1.000 | / | / | 0.695 |
| <i>SG</i> | Q5 | 1.000 | / | / | 0.811 |
| | Q6 | 1.189 | 0.046 | * | 0.887 |
| | Q7 | 1.051 | 0.050 | * | 0.754 |
| | Q8 | 1.007 | 0.050 | * | 0.737 |
| <i>CS</i> | Q9 | 0.888 | 0.042 | * | 0.782 |
| | Q10 | 0.991 | 0.043 | * | 0.883 |
| | Q11 | 1.000 | / | / | 0.799 |
| | Q12 | 1.015 | 0.050 | * | 0.766 |
| <i>CF</i> | Q13 | 1.044 | 0.054 | * | 0.631 |
| | Q14 | 1.000 | / | / | 0.677 |
| | Q15 | 1.469 | 0.091 | * | 0.699 |
| | Q16 | 1.307 | 0.074 | * | 0.810 |
| <i>CA</i> | Q17 | 1.236 | 0.068 | * | 0.861 |
| | Q18 | 1.107 | 0.062 | * | 0.798 |
| | Q19 | 1.107 | 0.064 | * | 0.781 |
| | Q20 | 0.920 | 0.049 | * | 0.717 |
| <i>SQ</i> | Q21 | 1.000 | / | / | 0.714 |
| | Q22 | 0.481 | 0.076 | * | 0.379 |
| <i>MQ</i> | Q22 | 0.686 | 0.090 | * | 0.481 |

Notes: * $p < 0.001$; factor loadings are unstandardized regression weights, while path coefficients are standardized regression weights

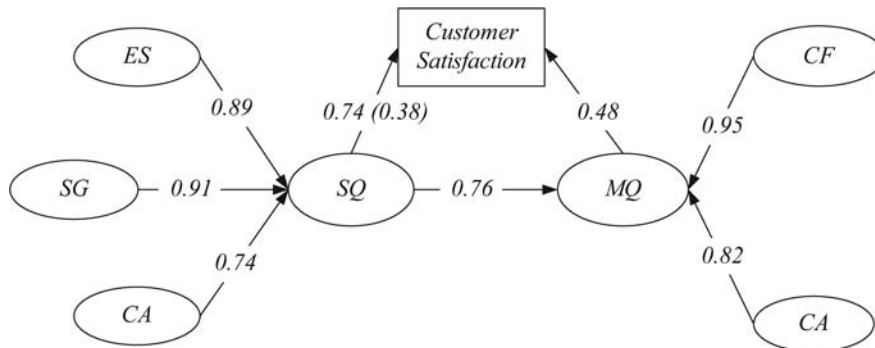


Figure 4.
Standardized estimation of
the structural model

Table III for details). By contrast, the path coefficient of management quality on customer satisfaction is 0.48. The results suggest that customers are more sensitive to the service quality maintained by FM Company. In addition, efforts on SG and CF would be the most effective way to improve customer satisfaction level.

Conclusions

In a competitive world of FM supplier, companies expect to increase the quality of service and customer satisfaction level. Therefore, the understanding of what drives the customer to be more satisfied is the key element of all. The motivation of this study is to provide an insight into the relationships between service quality (EO, SG and CS), management quality (CF and CA) and customer satisfaction. The study, for the first time, divides FMS into two interrelated clusters, which are denoted by two latent variables (i.e. service quality and management quality). Then we demonstrate the use of the SEM approach as a powerful tool to clarify the causal relationships between these latent and observed variables/factors. The new contributions of this paper are to improve the understanding of those two salient interrelated clusters that affect customer satisfaction.

The results strongly confirm the three hypotheses we set out previously:

- (1) service qualities = > customer satisfaction;
- (2) management quality = > customer satisfaction;
- (3) service qualities = > management quality

More precisely, the findings suggest both service and management quality have significant influence on customer satisfaction with total effect coefficient 0.74 and 0.48 respectively. Besides, the result confirms that service quality has a significant direct effect on management quality, as expected. This implies that service quality (comprising staff-related attributes) is the crucial latent variable in FMS delivery, and it has indirect influence on customer satisfaction mediated by management quality (comprising facilities-related attributes). Individual effects of observed variables on the relative latent variable are also evaluated in the SEM. Professional knowledge of staff, Safety consciousness of CS at work, fire services equipment, security level are indentified to be the most important factors in characterizing corresponding latent variables, which should be focused on by FM managers. Furthermore, the research

framework and methodology could also be useful to measure customer satisfaction of FM service delivery in other property sector (e.g. retail property, office property) with some necessary modification.

This research study is meaningful but it does have its limitations. First, the model is not completely exhaustive. In this case, some factors, such as FM fee, were not included in the survey. Second, the data we used are sectional. If we did conduct, say, a year-on-year survey, we might be able to character the structural change of the customer satisfaction and the relevant factors thoroughly. Nevertheless, this study is first of its kind to the best of our knowledge. It studies the interrelationships among observed and latent variables affecting FMS customer satisfaction. In future, further research is recommended by using SEM to examine the relationship between customer satisfaction and other variables in FMS. This will further improve the service provided by FM companies. Furthermore, the relationship between the customer satisfaction and loyalty, which has been fully investigated in many industries (see Bastos and Gallego, 2008 and the references therein), is seldom explored in the FMS research. We would argue that the property purchasers would consider the corresponding FM Company when they are purchasing properties. The property developers, thereby, would choose those companies with greater reputation, which is somehow reflected by customer loyalty.

Notes

1. In this specific study, it is important to note that the customers in this paper confine to the property owners and tenants, who receive FM services within a fixed property environment.
2. The selected property is one of the largest private residential estates in Hong Kong, with 6,648 households and approximately 30,000 residents. It is managed by one of the most reputed property companies in the territory.

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Further reading

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