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CHAPTER 20
Sustainability performance of construction: conceptual models of satisfaction levels in construction projects

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Abstract: In general, the performance of construction projects, including their sustainability performance, does not meet optimal expectations. One aspect of this is the performance of the participants who are interdependent and make a significant impact on overall project outcomes. Of these participants, the client is traditionally the owner of the project, the architect or engineer is engaged as the lead designer and a contractor is selected to construct the facilities. Generally, the performance of the participants is gauged by considering three main factors, namely, time, cost and quality. As the level of satisfaction is a subjective issue, it is rarely used in the performance evaluation of construction work. Recently, various approaches to the measurement of satisfaction have been made in an attempt to determine the performance of construction project outcomes – for instance, client satisfaction, customer satisfaction, contractor satisfaction, occupant satisfaction and home buyer satisfaction. These not only identify the performance of the construction project but are also used to improve and maintain relationships. In addition, these assessments are necessary for the continuous improvement and enhanced cooperation of participants. The measurement of satisfaction levels primarily involves expectations and perceptions. An expectation can be regarded as a comparative standard of different needs, motives and beliefs, while a perception is a subjective interpretation that is influenced by moods, experiences and values. This suggests that the disparity between perceptions and expectations may possibly be used to represent different levels of satisfaction. However, this concept is rather new and in need of further investigation. This chapter examines the methods commonly practised in measuring satisfaction levels today and the advantages of promoting these methods. The results provide a preliminary review of the advantages of satisfaction measurement in the construction industry and recommendations are made concerning the most appropriate methods to use in identifying the performance of project outcomes.

Keywords: Performance measurement, satisfaction level, construction industry, satisfaction measurement methods, key performance indicators.

Introduction
The performance of construction is an issue that has been debated for many years. Many efforts have been made in attempting to enhance construction performance. Despite the effective evaluation of the overall project outcomes being seen as fundamental, the optimal approach has not yet been discovered.

The evaluation of performance is gauged mainly on the basis of three main dimensions: cost, time and quality. However, soft measurements that consider participants' satisfaction have also been used in construction in order to improve existing methods.

The level of satisfaction is used as a Key Performance Indicator (KPI) – for instance, in identifying client satisfaction (Cl-S), customer satisfaction (Cu-S), contractor satisfaction (Co-S), occupant satisfaction (Oc-S) and home buyer satisfaction (Ho-S). Typically, these levels are regarded as a comparative function between perceptions and expectations (Cheng et al., 2006). Lam et al. (2008) state that projects that are delivered on schedule, are functional, fulfil safety requirements and conform to users' expectation greatly influence the judgement of performance. Moreover, owner satisfaction and profit margins are considered as indicators in performance (Ling et al., 2008). Another perspective is that satisfaction measurement is essential in examining the level of sustainability in terms of design and performance of the building. Although many efforts
have been made to explore the performance measurement issue, there is an absence of a common understanding of this approach among participants; thus, uncertainty remains. Given the above, the aim of this chapter is to identify methods that are commonly applied in gauging performance satisfaction levels in relation to project outcomes.

**Performance measurement in the construction industry**

The systematic measurement of performance is a significant activity as it is needed in order to determine areas of improvement. Basically, performance can be assessed on two dimensions: objective measures and subjective measures. As highlighted by Chan and Chan (2004), the objective approach uses mathematical formulae to calculate the value of the project based on time and cost, while the subjective approach uses subjective opinions and the personal judgement of participants. The latter mainly includes references to the quality and functionality of the building and satisfaction levels of the participants.

Time performance of the project is monitored according to the work program prepared prior to commencement of the project. Chan and Chan (2004) assert that time performance concerns the duration needed to complete the project according to its schedule and is calculated as the numbers of days or weeks from starting on site to the practical completion of the project.

Project performance also can be defined by the cost performance of the project. According to Ling et al. (2008), cost performance is a measurable indicator. Therefore, it can predict the difference between the actual and the budgeted cost of the project. Dissanayaka and Kumaraswamy (1999) note the consensus view is that of having projects completed within budget and close to the original cost estimate constitutes project success. Although cost performance indicators are broadly used to enhance the performance of projects, project failure can still occur for several reasons; for example, strategies not fully understood by the participants, lack of clarification of tasks to be performed, lack of milestones defining completion dates and insufficient planning (Doloi and Lim, 2007).

Conversely, measures of quality, functionality, and satisfaction are rarely used in evaluating the level of the project performance due to their subjective nature and need for in-depth interpretation. Differences in levels of happiness, personalities, places and situations are further complications. Nevertheless, the relationship between the quality of outcomes, satisfaction levels and project performance has been continuously investigated by many researchers over the last ten years.

Quality is a common determinant that is applied to assess the level of performance in construction projects. Ennew et al. (1993) define quality as the ability of a service or product to perform its specified tasks. In addition, project performance also can be obtained based on the participants' satisfaction levels. This approach can provide a negative or positive result by comparing perceptions and expectations. Martzler et al. (2004) agree that satisfaction measurement is a relevant method in encouraging continuous improvement of a project. However, these approaches suffer from limitations and are in need of improvement.
The concept of satisfaction measurement

Measures of performance can be made in many ways. Previous studies assert that performance is mainly determined by the participants of the construction projects and they are also interdependent. Soetanto and Proverbs (2002) emphasize that satisfaction measurement generally involves psychological processes. Therefore, it would be useful if some consensus existed on the definition of satisfaction. As Oliver (1980) explains, satisfaction is derived from the Latin satiās (enough) and fācere (to do or make). This suggests that satisfying products and services have the capacity to provide what is being sought to the point of being enough. Something that satisfies adequately fulfils expectations, needs or desires and gives what is required, leaving no room for complaints.

Churchill et al., (1982) conclude that most of the previous research focuses on the link between expectation and perceived performance. In addition, expectations, experiences and knowledge have been shown to be basic judgements in evaluating satisfaction (Woodruff et al., 1983). In business, customer evaluation is important in order to meet the customer's expectations, create loyalty and meet challenges. It also encourages service providers in maintaining high service quality and assists in determining the level of employees' performance and efficiency (Liu et al., 2006). In marketing disciplines, satisfaction is examined by comparing pre-purchase expectations with post-purchase perceptions (Forsythe, 2007).

Satisfaction has been considered in various perspectives. For instance, job satisfaction has been broadly studied. Nerkar et al. (1996), for example, found that an individual assessment of job satisfaction is a function of the discrepancy between what an individual expects from the job and what the individual receives. In other words, job satisfaction can be measured as the extent to which rewards meet the perceived level of rewards, and the extent to which job experiences provide a positive emotional response. In marketing management, consumer expectations are determined by the implicit comparison of the expected and the actual. Częstochowski et al. (1977) suggest that three formulas are appropriate in gauging expectations as part of satisfaction measurement. However, consumer satisfaction and decision processes may be influenced by several variables such as attitudes, perceptions, psychographic segments and behaviour. In summary, therefore, satisfaction is a judgement about, or response to, the pleasurable level of consumption fulfilment made by the participants with regard to a product or service.

Studies of satisfaction have been carried out since the 1960s (Oliver 1980). Commonly, these were major marketing research studies used to assess likely client satisfaction through opinion surveys. Several aspects or criteria are used to identify levels of client satisfaction, including product quality, service quality, cost management and timeliness (Nowak and Washburn, 1998). Thurau and Klee (1997) assert that quality is primarily treated as an overall construct based on the customer's previous experience and impressions of a product or service. A client's evaluation of product quality in marketing research is based on the feedback given concerning the overall quality of the final product and clarity of product results. SERVQUAL is a scale used to evaluate the perceptions-expectations gap. It is a component of overall client satisfaction as it comprises tangibles, reliability, responsiveness, assurance and empathy (Cronin, 1994). However, this approach has limitations as customers do not necessarily purchase the
highest quality service, but may also consider convenience, price and availability factors.

Cost management has been found to be the most important factor in ensuring that the provider delivers a product or service within budget. This measure is one of cost management and not of ability to provide the product at the lowest cost (Su, 2004). However, timeliness is frequently a major concern for clients who are under pressure to react quickly to changing market conditions in a highly competitive environment (Nowak, 1998).

On the other hand, customer satisfaction or dissatisfaction results from experiencing a service and comparing that experience with the kind of quality of service that was expected. Many studies of customer satisfaction have concluded that there is a significant relationship between customer satisfaction and loyalty (Su, 2004; Wirtz, 2001; Grigoroudis and Siskos, 2004; Liu et al., 2006, 1999; Walker, 2001). Therefore, the primary objective of service providers and marketers is identical: to develop and provide services that satisfy customer needs and expectations. In short, in the service industry, the goal of the service marketer is to close or narrow the gap between the expectations and perceptions of customers.

Conceptual models of satisfaction measurement in construction
The construction industry is challenged by the need to cope with change. Performance measurement is dominated by the main parameters of quality, time and cost of projects. However, to obtain a high product quality, performance has to be evaluated thoroughly and effectively. Success can be considered to have occurred if the project is completed within the required budget, within the time given, and if it represents quality as specified in the contract; however, the client still needs to be satisfied. For that reason, satisfaction is an appropriate indicator for evaluating the performance of a project. The construction industry is similar to the marketing or business industry in terms of the involvement of numerous stakeholders and their satisfaction related to the performance of subsequent projects or products. Recently, many studies have been undertaken concerning behavioural management—mainly studies of CI-S and Cu-S (Palaneswaran et al., 2006; Wong, 2004).

Studies of satisfaction have noted that satisfaction is subjective and difficult to measure, and that models of satisfaction are largely conceptual (Procter et al., 1999); however, there are attempts to deal with client satisfaction of consultant performance. Commonly, satisfaction can be assessed at interim stages, final stages and overall. Three elements are applied in satisfaction measurement: comparing product and service delivery, final outcome satisfaction, and satisfaction with satisfaction. Cheng et al. (2006), state that overall services, technical accuracy and people are the key performance attributes for consultants as perceived by clients.

Satisfaction evaluation is fundamental for construction participants if they are to survive in the marketplace. Tang et al. (2003) has concluded that by measuring CI-S, the performance in delivering services can be improved continuously and areas for consultant improvement can be identified. For example, research has shown that more effort should be made to overcome the weaknesses of engineering consulting services in Hong Kong, as these weaknesses are slightly greater than those in other professional
services. Cheng et al. (2006) identify technical accuracy, overall quality of service, people, and effective communication as the main CI-S criteria. Mbachu and Nkado (2006) found that there are areas for improvement in the services of contractors and consultants, noting that the evaluation of CI-S is a result of the clients' perceived average levels of satisfaction in the building development process.

Sohails (1995) stresses the benefit of taking an aggressive approach to identifying CI-S levels and identifying the changes needed to eliminate problems. In the construction industry, the clients' needs or requirements are usually assumed to be to attain the end product within budgeted cost and time. Soetanto and Proverbs (2004) have suggested that satisfaction and performance are related as performance outcomes are the input, and levels of satisfaction or dissatisfaction are the output (Figure 1). Most of the studies agree that between the input and output, a psychological processing or black box exists that requires rational consideration when making decisions.

Figure 1: A mediated performance model of satisfaction (Soetanto & Proverbs, 2002)

Ahmed et al. (1995) identify the major factors that influence CI-S of contractor performance; namely, timeliness, client orientation, communication, cost, quality and response to complaints. Soetanto and Proverbs (2004) emphasize the importance of measuring an abstract notion such as satisfaction level, and that the concept should be observable and measurable and defined at an operational level. Moreover, Cheung et al. (2000) propose dispute resolution satisfaction as an effective measurement for the attainment of project objectives as it consists of several variables that need to be considered. This shows that evaluation of satisfaction enables clients to reduce uncertainty and antagonism and hence improve working relationships and trust.

On the other hand, CI-S evaluation can be implemented to help maximise long term profits. This could be achieved by avoiding several situations, such as project team changes, multiple architect/engineer team contracts, schedule delay and missed milestones, over designing, negative approaches to problems, low quality product, slow response to queries, slow review submittals, weak leadership and absence at final completion (Haransky, 1999). Many studies greatly emphasize Cu-S and the difference between expectations and perceptions. Maloney (2002) incorporates these ideas into guidelines for customers in evaluating electrical contractor service quality and their influence on perceived quality. Moreover, Yang and Peng (2008) assert that evaluating the performance of service providers helps them to improve their services. They used a questionnaire survey and statistical analysis as a tool for assessing satisfaction levels.

Several research projects have been undertaken aimed at developing a satisfaction evaluation methodology for the construction industry and the measurement of satisfaction in performance of procurement systems. As an example, Jamali (2007) identified satisfaction evaluation to be appropriate for measuring the level of Cu-S of the quality of services received by Public-Private Partnerships (PPPs). SERVQUAL measures Cu-S by incorporating both a cognitive component (assessment of basic quality dimensions) and affective components (including variables such as emotions, attributes and perceptions of equity).
Forsythe (2007) notes that Cu-S in the residential construction industry is influenced by genetic make-up and emotional factors. In addition, there are four components involved in customer behaviour in making decisions: decision process, input, information processing and decision process variables. This approach could create a competitive advantage in the market place, increased market share, improved profitability and increased reputation. Leung et al (2004) believe the discrepancies between goals that are determined by the measurement can enhance levels of satisfaction.

Satisfaction study has developed in the construction industry to investigate home buyer satisfaction (Ho-S). This measurement is important as it can be applied as an indicator of a project team’s performance level. Torbica and Ricoh (2001) state that quality of the product and service is the main antecedent to determining Ho-S. However, this study highlighted that Ho-S is not only influenced by the product design or the product quality but that characteristics of the home buyer—such as experience, income, age, knowledge and location—play a role in determining overall home buyer satisfaction. Furthermore, an instrument to investigate Ho-S—HOMBSAT—is introduced in the same study. The instrument comprises of three main dimensions, namely, house design, house quality and service, and is applied to improve product and service quality.

The determination of levels of satisfaction of occupants is needed to address discrepancies between the design and the performance of the building. Additionally, this method is of major importance to the client and designer as it provides a mechanisms for identifying occupant feedback based on Post Occumant Evaluation (POE). Liu (1999) emphasizes that several approaches can be applied for the building performance appraisal process: i) determining the physical and social factors which affect housing residents’ satisfaction, ii) developing performance criteria and grading tools, iii) identifying the relationships between residential satisfaction and children’s accident risk, spatial density, crowding and neighbourhood characteristics, and iv) undertaking a quality appraisal of the building design in terms of both function and cost. This POE is conducted during the design stage as value engineering, and after completion of the building.

From another perspective, satisfaction measurement has also been applied to examine the comfort perceptions of occupants of green buildings (Figure 2). Paul and Taylor (2008) report that the Oc-S is examined on several environmental indicators namely: aesthetics, serenity, lighting, acoustics, ventilation, temperature, and humidity. The study is significant as it offers some features that relate to the indoor environmental quality such as: natural ventilation, the use of low-toxicity finishes and furnishings, natural lighting for a better quality of illumination, operable windows and fans, and recycled materials. This means that satisfaction measurement can be applied practically in the construction industry to determine areas that need improvement in terms of sustainable development.

**Figure 2:** The effect of building type on occupant comfort and satisfaction (Paul & Taylor, 2008)
Based on the above discussion, there is a consensus among researchers that consideration of satisfaction levels of construction projects will: lead to harmonious working relationships among participants; foster the pursuit of continuous improvement; create a mutual process in the real sense; support the development of long term relationships and high satisfaction levels; and, ultimately, create a performance-enhancing environment (Soetanto and Proverbs, 2004; Cheong et al., 2003; Leung et al., 2004; Haransky, 1999; Ahmed et al., 1995; Naoum, 1994). However, there have been few studies focusing on the level of Co-S as an indicator of performance. This is despite the fact that Co-S is, in the early stage of the project, the best predictor of problems before they develop into conflicts. A model of Co-S (Figure 3) based on client performance has been established in order to identify corrective action needed to improve cooperation and communication, and to maintain trust and cohesiveness (Soetanto and Proverbs, 2002).

Figure 3: Contractor satisfaction models based on client performance (Soetanto & Proverbs, 2002)

Conclusion
Performance measurement has been studied widely in the construction industry. The recent interest in gauging performance based on subjective indicators such as satisfaction levels could be seen as a new and attractive approach in this field. Measurement based on satisfaction levels is commonly used in marketing and business, as customer loyalty can be evaluated according to the gap between expected and perceived product performance. Satisfaction measurement has also been used in measuring construction project performance as it can determine efficiency and encourage participants to maintain high service quality. The approach has been extensively applied to measure Cl-S, Cu-S, Co-S, Oc-S and Ho-S.

This preliminary study indicates that different participants judge satisfaction in different ways. The level of Cl-S, Cu-S, Oc-S and Ho-S are influenced by time, cost, client orientation, communication skills and the effectiveness of response to complaints. Co-S should be achieved by completing a project according to plan, within cost and time budgets, satisfying owner needs, and generating profits. Additionally, satisfaction measurement is important to enhance environmental quality levels in order to meet sustainability requirements. Future work will investigate the attributes and the relationships of the variables by in-depth interviews and surveys of Malaysian contractor satisfaction. The detailed result is expected to provide a useful assessment method for contractors and participants in enhancing construction performance.

References


