Research on the Optimization of Total Quality Management of Housing Construction Projects Based on SERVQUAL Model - A case study of A university

Chen Chen

[1]. Baise University, Guangxi.China.

[2].Krirk University, Thanon Ram Intra, Khwaeng Anusawari, Khet Bang Khen, Krung Thep, Maha Nakhon10220, Thailand

Email: 753550470@qq.com

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ABSTRACT: This paper first pointed out that the goal of TQM is to increase customer satisfaction. Then, this paper used the five dimensions of the SERVQUAL model to collect keywords and design a questionnaire to demonstrate how this questionnaire reflects customers' general satisfaction. This paper also added the variables of the Owners Committee's participation in TQM and studied its direct and indirect correlation with general satisfaction. Finally, this paper proposed to improve the quality guarantee of housing constructions and make Owners Committee participate in TQM to increase customer satisfaction and optimize quality management.

Keywords: Owners Committee, Customer Satisfaction, SERVQUAL Model, Real Estate Market, TQM

INTRODUCTION

1.1 Background

Currently, the balance of the seller's market dominated by producers has begun to tilt towards consumers in the real estate business. The enterprises' competitiveness is dominated mainly by consumers. Quality guarantee is essential for an enterprise's survival and development and the red line for exploring the market. For consumers, quality is the first criterion of purchase. Therefore, quality management is the priority of enterprises and people's livelihood. Quality management has gone through three stages: the quality inspection stage, the statistical quality management stage, and the TQM stage.

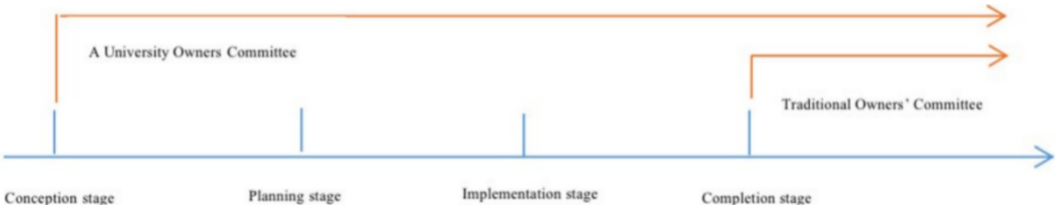
1.1.1 Owners Committee

Owners Committee is the executive body of the owners' assembly. It refers to the representatives elected by the owners in the property management area, representing the interests of the owners by implementing the decisions of the owners' meeting, reporting the desires and requirements of the owners to all parties in the society, and supervising and assisting the property service enterprises, or other managements executing the property service contract. At this stage, the establishment of Owners Committee is generally established after the houses or apartments are delivered, and its primary responsibility is to supervise and manage the property company.

1.1.2 Introduction of Owners Committee in the Housing Construction Project of A University.

A University housing construction project began to prepare for an owners' committee at the beginning of the project's planning. The representatives of the owner committee were voted by those customers who paid purchase deposits to conduct quality supervision and communication throughout the construction process.

Figure 1:Participation of Owners Committee in the whole construction process

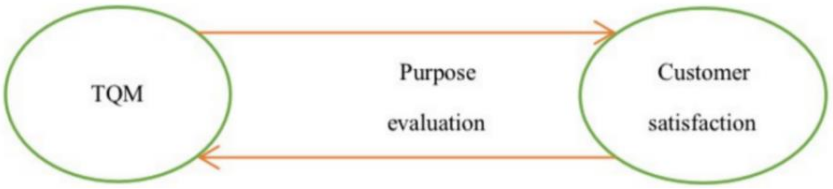


1.2

Research subjects and purpose

Murmura and Bravi1 explored customers' perceptions of the quality management system of the enterprise. Compared with quantity, mature customer groups give more importance to the quality of products and services, and enterprises with a quality management system obtain higher customer satisfaction. TQM aims to ensure that products and services meet customer s' needs and obtain their continuous satisfaction through systematic management. This study used statistics on A University's Owners Committee's general satisfaction to initially evaluate whether Owners Committee's participation in the TQM of the building's entire process played an optimal role and provided a feasibility basis for future in-depth research.

Figure 2:The correlation between TQM and customer satisfaction



LITERRATURE REVIEW

2.1 TQM The importance of the customers in theory

In the 1990s, the theory of TQM became popular globally. Many companies have pursued and implemented full-field and multi-level TQM based on traditional quality management. However, consumers are at the very end of the product demand chain. Ignoring the consumers' needs and blindly pursuing ideal quality management may lead the companies to make wrong decisions concerning product quality and reduce the effectiveness of quality management. Therefore, it is urgent to engage consumers in TQM activities on a theoretical basis.

From the perspective of Marx's commodity economic theory, scholars such as Yang Shizhong2 believed that usable value is quality, which means the improvement of quality in the quality management reform is the improvement of usable value. Liu Shilan3 believed that quality is to meet or exceed customers' expectations, and quality itself has the characteristic of "applicability" and "transcendence". In the quality manual, the well-known American quality expert Juran4 put forward that quality is derived initially from customers' needs. Therefore, the goal of TQM is not only to improve the quality of the service or provide products and services to meet customers' needs and be favored by the market, but it's also to manage with the principles of customers-based and market-based systematically.

2.2 Establishment of the SERVQUAL model

SERVQUAL theory is a new service quality evaluation system proposed in the service industry by American marketing experts Parasuraman, Zeithaml, and Berry in the late 1980s based on the Total Quality Management Theory (TQM). The specific content of the SERVQUAL model consists of two parts: The first part contains 22

items, which record the expectations of customers for outstanding companies in a specific service industry; the second part also includes 22 items, which measure how consumers feel about a particular company (i.e., the company being evaluated) in this industry. Then compare the results obtained in the two parts to get each "gap score" of the five dimensions. The smaller the gap, the higher the evaluation of service quality.

In the past ten years, the SERVQUAL model has been widely accepted and adopted by managers and scholars. The core theory of this model is the "service quality gap model", which means the quality of service depends on the degree of difference between the service level perceived by the users and expected by the users. The expectations of users are the prerequisite for high-quality services. The key to providing high-quality services is to exceed the expectations of users. SERVQUAL divides service quality into five levels: tangibility, reliability, responsiveness, security, and empathy.

2.3 Application and controversy of SERVQUAL model

Both Kilbourne and Lam used the SERVQUAL model to conduct service quality research on the healthcare industry. Lam used the SERVQUAL model to conduct a service quality study on the banking industry. Van der Wal used the SERVQUAL model to study the telecommunication industry's service quality. Lee used the SERVQUAL model to study the service quality of the fast-food industry.

Ekinci and Riley believed that the concept of "subtraction" in the SERVQUAL model is not equivalent to mental function. Besides, Brown et al. questioned the construct validity of gap scores because they are unlikely to demonstrate their components (i.e., perceptions and expectations). Babakus and Boller believed that the primary factors affecting the accuracy of scores are expectations and perceptions because consumers tend to give higher scores to expectations.

Although the calculating method and scale items of the SERVQUAL model have always been controversial, its five dimensions have been widely recognized. Peter pointed out that practitioners need a standard model with cross-industry and cross-functional potential. Despite numerous criticisms, the SERVQUAL model continues to be used as a helpful tool and attracts academics and practitioners. After reviewing many applications and criticisms of the SERVQUAL model, the author believes that although people have good reasons to worry about the efficiency of the scores, this model remains a helpful service quality measurement tool. It is important to note that the SERVQUAL model should not be used under any circumstances. Researchers should use the SERVQUAL model to develop methods that meet their own needs. For example, they could verify the reliability and validity after collecting the data with the model.

RESEARCH METHODS

3.1 Research design

This study uses a satisfaction questionnaire survey to engage Owners Committee to participate in the TQM of housing construction. The determination of the user satisfaction index is a complicated and challenging process. This paper uses the five dimensions of service quality in the SURVQUAL evaluation model to look for information from the documentation, determine the conceptual framework in this article through classification and preliminary selection of keywords, and then make a suitable questionnaire to study the measures of the quality management of housing construction project for optimization.

3.2 Collection of the keywords

According to the theme and research content, we have a preliminary understanding of the factors influencing buyers' satisfaction and collect the keywords for the questionnaire by consulting the documentation.

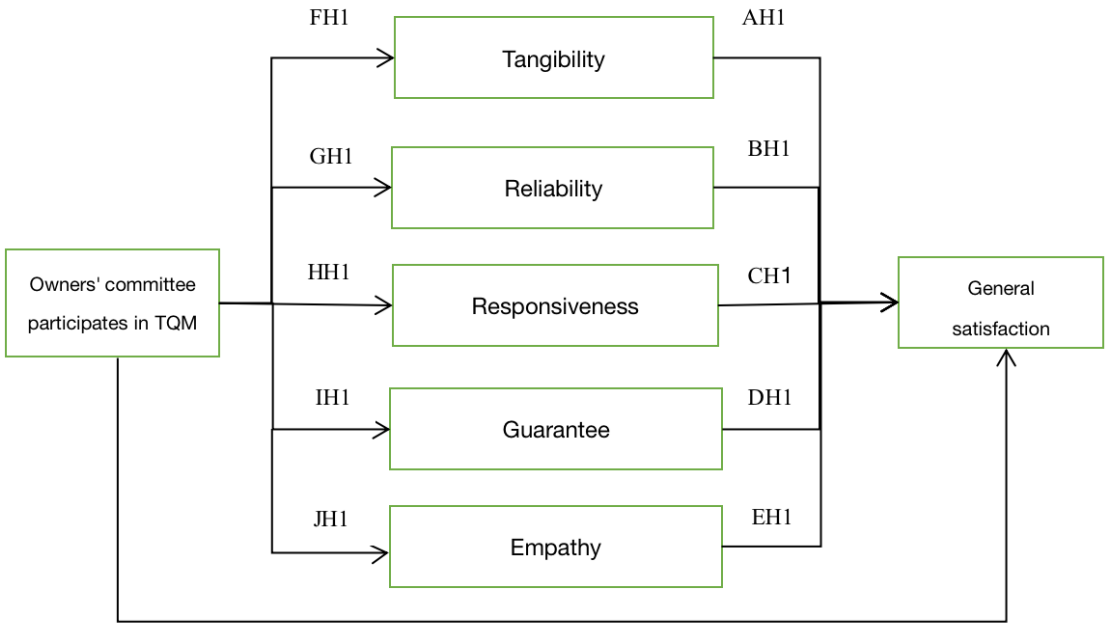
Table 1: Keywords collection

Five dimensions in the SURVQUAL evaluation model	Keywords	Author, year	Theme
Tangibility	Direct perception	Lepkova,2016	Study of Customer Satisfaction with Living Conditions in New Apartment Buildings.
Reliability	promise		
Responsiveness	assist		
Guarantee	professional skill	Chini,2003	ISO 9000 and the U.S. Construction Industry.
	credibility		
	sense of security	Parasuraman,1988	SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality.
	courtesy		
Empathy	Customers perspective		

3.3 Questionaire design

After data sorting and counting, the above independent variables are classified and analyzed. Based on analyzing the frequency of keywords in the documentation, the intensity of keyword search, and buyers' satisfaction, we obtained the research variables and established the theoretical model, as shown in Figure 3.

Figure 3: questionnaire design model



The first letter is the number of question assumptions,such as AH1,BH1.H1 is the hypothesis that will make a difference.

According to the model, the questionnaire was designed as shown in the following table. This study uses the Likert scale to investigate the satisfaction of the housing construction project of A university. The Likert scale consists of 10 questions, and each question gives five answers in options: 5, 4, 3, 2, 1, which represent very satisfied, satisfied, neutral, dissatisfied, and very dissatisfied.

Table 2: Satisfaction survey on the housing construction project of A university

Satisfaction survey on the housing construction project of A university			
1	General satisfaction	6	Products, decorations, personnel clothing, equipment, equipment that are directly perceived
2	Professional skills of staff	7	Providing personalized services from the customer's point of view
3	Credibility of staff	8	Ability to fulfill promises
4	Sense of security in the construction project	9	Willingness to help customers and quickly improve service levels
5	Courtesy of staff	10	Participation of Owners Committee in TQM

3.4 Analyzing tool

This study uses the free link provided by the online questionnaire website "Wenjuanxing" . 38 questionnaires had been collected from the owners of the housing construction project of A university, among which 38 were valid. The questionnaire link is https://www.wjx.cn/vj/rXhALG1.aspx.Then we use SPSS software for descriptive statistics and regression analysis of correlation on the answers from the questionnaires.

RESULTS AND DISCUSSION

4.1 Reliability and validity analysis

In reliability analysis, whether the Cronbach’s coefficient of the scale meets the standard is an essential reference for the stability and consistency of the test. This study redesigned a targeted questionnaire based on the five dimensions of the TQM SURVQUAL Evaluation Scale. To ensure the consistency of the measurement scale of the questionnaire, a reliability analysis of the questionnaire is further required.

At present, the researchers generally use Cronbach’s numerical value to test the reliability of the questionnaire. Its value shift generally between 0 and 1. The larger the value, the better the internal consistency of the questionnaire's measurement items. The value of Cronbach's coefficient greater than 0.65 indicates that the questionnaire is credible. A value between 0.7 and 0.8 indicates that the internal consistency of the measurement items of the questionnaire is decent. A value greater than 0.8 indicates that the questionnaire design is scientific, reasonable, excellent internal consistency, and highly credible.

The result of validity analysis indicates whether the questionnaire objectively reflects the situation in the surveyed field, which is also called validity test and accuracy test. The KMO value is to determine the validity of the questionnaire. If the KMO value is higher than 0.6, the validity is qualified.

The overall Cronbach’s a and KMO values of the survey questionnaires in this study have reached high standards, indicating that the questionnaire is with sufficient reliability and validity, and there is no need to modify the items further, as shown in the following table.

Table 3: Overall Cronbach's a and KMO values of measurement items

Number of questionnaires	Number of projects	Cronbach's a coefficient	KMO value
38	10	0.972 (>0.65)	0.904(>0.6)

4.2 Correlation analysis

The analysis of 10 variables in the questionnaire has been done to test whether there is a correlation between different independent variables and dependent variables. If the correlation analysis shows no correlation variable, then the next step of regression analysis is unnecessary. If there are correlated variables, then the accuracy correlation between them needs to be further verified through regression analysis.

Table 4: Correlation between variables

		1	2	3	4	5	6	7	8	9	10
1	Pearson correlation	1	.743**	.776**	.834**	.736**	.882**	.898**	.770**	.823**	.842**
	Sig. (Two-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
2	Pearson correlation	.743**	1	.795**	.872**	.655**	.779**	.777**	.744**	.692**	.708**
	Sig. (Two-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
3	Pearson correlation	.776**	.795**	1	.784**	.735**	.815**	.800**	.764**	.693**	.640**
	Sig. (Two-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
4	Pearson correlation	.834**	.872**	.784**	1	.681**	.829**	.777**	.698**	.677**	.698**
	Sig. (Two-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
5	Pearson correlation	.736**	.655**	.735**	.681**	1	.773**	.688**	.661**	.658**	.602**
	Sig. (Two-tailed)	.000	.000	.000	.000		.000	.000	.000	.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
6	Pearson correlation	.882**	.779**	.815**	.829**	.773**	1	.897**	.731**	.722**	.761**
	Sig. (Two-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
7	Pearson correlation	.898**	.777**	.800**	.777**	.688**	.897**	1	.858**	.838**	.818**
	Sig. (Two-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
8	Pearson correlation	.700**	.744**	.764**	.698**	.661**	.731**	.858**	1	.905**	.718**
	Sig. (Two-tailed)	.000	.000	.000	.000	.000	.000	.000		.000	.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
9	Pearson correlation	.823**	.692**	.693**	.677**	.658**	.722**	.838**	.905**	1	.811**
	Sig. (Two-tailed)	.000	.000	.000	.000	.000	.000	.000	.000		.000
	Number of cases	38	38	38	38	38	38	38	38	38	38
10	Pearson correlation	.842**	.708**	.640**	.698**	.602**	.761**	.818**	.718**	.811**	1
	Sig. (Two-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	Number of cases	38	38	38	38	38	38	38	38	38	38

The items presented by the numbers in Table 4 are as follows: 1- General satisfaction, 2 - Professional skills of staff; 3 - Credibility of staff; 4 - Sense of security in the construction project; 5 - Courtesy of staff; 6- Products, decorations, personnel clothing, equipment, equipment that are directly perceived; 7 - Providing personalized services from the customer's point of view 8 - Ability to fulfill promises; 9 -Willingness to help customers and quickly improve service levels; 10 - Participation of Owners Committee in TQM.

When the Pearson correlation coefficient is $0.5<r<=0.8$, it represents a significant correlation. When the correlation coefficient is $0.8<r<=1$, it represents a high degree of correlation. We can see from Table 4 that there is a high correlation among the ten variables, and they are all significantly or highly correlated. Sig (significance test) $P<0.01$, indicating that the difference is highly significant. Therefore, no variable needs to be deleted or modified, and the next step of regression analysis can be carried on.

4.3 Regression analysis

4.3.1 Regression analysis of general satisfaction as a dependent variable

Use the five dimensions of the SUVRQUAL model and the participation of Owners Committee in TQM as independent variables, and use general satisfaction as the dependent variable for regression analysis. Use "R-square", "Durbin-Watson", "Significance" and "VIF" values to gradually judge the validity of the model and data and then verify the accuracy of the setting questions.

Table 5: Model abstract (general satisfaction as the dependent variable)

Model Abstract			
Model	R	R-square	Durbin-Watson
	0.953	0.909	2.020

Explanation of table 5: R-square>0.6 is academically recognized and proves that the model is suitable for the data. Durbin-Watson is in the range of 1.8-2.2, indicating no icolinearity, and the variable setting is reasonable.

Table 6: Coefficients (general satisfaction as the dependent variable)

Coefficients				
	Model	B	Significance	VIF
DH1 guarantee	Professional skills of staff	0.060	0.614	4.489
	Credibility of staff	-0.207	0.069	5.410
	Sense of security in the construction project	0.354	0.008	5.607
	Courtesy of staff	0.104	0.345	2.997
AH1 tangibility	Products, decorations, personnel clothing, equipment, equipment that are directly perceived	0.104	0.565	9.316
EH1 Empathy	Providing personalized services from the customer's point of view	0.323	0.061	11.141
BH1 Reliability	Ability to fulfill promises	-0.156	0.287	8.894
CH1 Responsiveness	Willingness to help customers and quickly improve service levels	0.225	0.151	8.499
KH1 Owners	Participation of Owners Committee in TQM.	0.171	0.095	4.348

Explanation of table 6: The hypothesis DH1(Credibility of staff)’s significance is 0.008<0.05, and the VIF value is 5.607<10, which is accepted. AH1, BH1, CH1, and KH1 are all rejected, accepting the null hypothesis. Among the four keywords of ‘Guarantee’, the correlation coefficient of " Sense of security in the construction project " is much higher than the other three keywords, and it is the only one that passes the test of significance and collinearity. Guarantee and general satisfaction are positively correlated. Its correlation coefficient is 0.354, which means guarantee satisfaction increases by 1 unit of points, and general satisfaction increases by 0.354 units of points.

4.3.2 Regression analysis of the five dimensions of the SURVQUAL model as dependent variables

A University innovatively engages Owner Committee to participate in the TQM of the construction project. This research studies the influence of Owners Committee on the five dimensions of the SURVQUAL model and studies how Owners Committee indirectly influences the owners' general satisfaction. This section of the paper takes Owners Committee as the independent variable and five dimensions as the dependent variable for regression analysis. Among the five dimensions, only the “Sense of security in the construction project” in the guarantee (DH1) is accepted, and continued research on other dimensions loses value. Therefore, the “safety of the construction project” the only dependent variable in the guarantee (DH1).

Table 7: Model abstract (SURVQUAL model dimensions as dependent variables)

Model Abstract			
Model	R	R-square	Durbin-Watson
	0.798	0.634	2.169

Explanation of table 7: R-square>0.6 is academically recognized and proves that the model is suitable for the data. Durbin-Watson is in the range of 1.8-2.2, indicating that there is no collinearity.

Table 8: Coefficients (SURVQUAL model dimensions as dependent variables)

Coefficients			
Model	B	significance	VIF
IH1 Participation of Owners Committee in TQM	0.635	0.000	1.000

Explanation of table 8: the significance is 0.000<0.05, and the VIF value is 1.000<10, so the hypothesis IH1 is accepted, and the null hypothesis IH0 is rejected. Owners committee’s participation in TQM is positively correlated with the assurance of the SURVQUAL model. Its correlation coefficient is 0.635, which means when the satisfaction of the Owners committee’s participation in TQM increases by 1 unit, the guarantee increases by 0.635 units.

CONCLUSION AND SUGGESTIONS

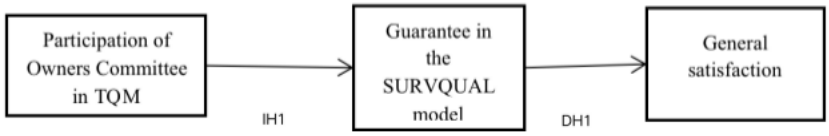
5.1 Conclusion

From the regression analysis in Chapter 4, we can see that only IH1 and DH1 are accepted as alternative hypotheses in all hypothesis questions, which means Owners Committee can influence the guarantee, and the guarantee can influence the general satisfaction. In this study, the regression analysis showed that tangibility, reliability, responsiveness, and empathy didn’t significantly affect general satisfaction with the five dimensions of the SURVQUAL model as independent variables and general satisfaction as the dependent variable. However, the guarantee has a high positive correlation with general satisfaction, with its correlation coefficient reaches 0.354. The regression analysis also showed a very high positive correlation, with its correlation coefficient

reaches 0.653, with the participation of Owners' Committee in TQM as the independent variable and the guarantee in the SURVQUAL model as the dependent variable.

Figure 4:Accepted assumptions

TQM as the independent variable and the guarantee in the SURVQUAL model as the dependent variable.



Therefore, we obtain a favorable result for this research: the participation of the Owners Committee in the housing construction project TQM can improve the quality of the project. Improving the guaranteed quality of the project can increase the general satisfaction .Then realize the optimization of total quality management.

5.2 Proposal

This research uses the five dimensions of the SURVQUAL model to extract keywords from documentation to design the questionnaire instead of using the fixed scale of the SURVQUAL model. The next step of the research can use the fixed scale of the SURVQUAL model to compare and analyze with this research for finding the most suitable questions.

This research is a simple exploratory for innovative learning, for which reason there are not enough samples as studying objectives, which may cause inaccurate rejected alternative hypothesis (H1). The next step of the research is to collect more than 200 samples to make the research results more accurate and reliable.

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