Factor Analysis of Service Quality of Provincial Contractors to Owner Satisfaction in Construction Projects in Thailand

Grit Ngowtanasuwan
Construction Management Program, Faculty of Architecture, Urban Design, and Creative Arts, Mahasarakham University, 44150 Thailand
grit_n@hotmail.com

Abstract. Service quality in construction projects involves the project owner’s perception of the process in terms of interactions, activities, and the attainment of acceptable levels of performance from construction activities. The purpose of this study is to present a factor analysis of service quality of provincial construction contractors in north-east Thailand that influences the satisfaction of project owners, by using Exploratory Factor Analysis (EFA). A total of 132 questionnaires, completed and returned by project owners, were analyzed to confirm the factors. The research found the service quality of the provincial contractors comprised of three factors, namely: (1) empathy, (2) responsiveness, and (3) tangibles, respectively. Guidelines for strategy for improving the service quality of provincial contractors are discussed and presented in the results of this research paper.

1. Introduction
The construction business is a service industry in which servicers (construction contractors) must emphasize the service quality of their work in order to satisfy the project owners and successfully compete for work on future projects [1]. The repeating calls of the project owners for future projects are the most important factors for contractors to ensure sustainability of their business in the construction industry. There are many contractors working in provincial areas in Thailand, but these are largely small enterprises using low technology. In order to sustain their business in the industry, contractors often ask: How can we know and understand which factors relate to the service quality of contractors? Which factors have effects on owner satisfaction and their behavioral intention to offer contractors work on future projects? What strategies should be followed in order to increase the service quality of contractors? As such, the main objective of this research is to study and analyze the factors and variables which relate to the service quality and the project owners’ satisfaction of provincial contractors in the Thai construction industry. Results will allow provincial contractors to assess the current status and guidelines for the development of their operations in the industry. The scope of this study is based on an opinion survey in terms of construction service quality of project owners who experienced construction projects with contractors. The projects are located in the central area of north-east Thailand, and include Roi-ed, Khon Kaen, Maha Sarakham, and Karasin provinces. Finally, strategies for the development and support of the service quality of Thai provincial contractors are presented.

2. Literature review
The Cambridge dictionary [2] defines a contractor as a person or company that arranges to supply materials or workers for building construction and performs work on a contractual basis. A contractor
is responsible for providing all of the materials, labor, equipment, and services necessary for the construction of a project [3]. A general contractor often hires specialized subcontractors to perform all or parts of the construction work. When using subcontractors, the general contractor is responsible for the quality of all work performed by any and all of the hired workers [3]. Krungsri research center [4] reported that there are some 80,000 construction companies registered for commercial activity in Thailand. Of these, only around 55 qualify as large-scale companies, but an examination of their income shows that these hold a 50% market share measured by income, and that most are registered on the SET (Stock Exchange of Thailand). The three largest contractors, Italian Thai, Ch. Karnchang and Sino-Thai, account for over 50% of the combined income of all construction companies traded on the SET. From this information, there are many construction companies or contractors still operating their construction businesses in Thailand, and these can be classified as small-medium enterprises, using low technology, and who need to improve their service quality. Service quality is generally known as a requirement for attributing success to business firms who have to improve service quality in order to survive in a competitive environment and sustain their customer base. Garvin [5] stated that service quality takes the customer’s perspective of quality and focuses on all things that influence the customer’s zone of awareness of quality. It is a relativistic evaluation in terms of varying from one customer, relative to another. In construction, service quality involves the customer’s perception of the process in terms of interactions, activities, and dynamic events. It also involves the customer’s perception of how the work takes place on-site [6]. Quality in the construction industry can be defined as the attainment of acceptable levels of performance from construction activities. This performance would be attained when the activity meets or exceeds the requirements of the project owner. The quality of any product or service is achieved when it conforms to the desired specifications. Parasuraman et al. [7, 8] developed a tool for measuring service quality called SERVQUAL in which service quality is defined as the degree of discrepancy between customers’ expectations of a service and their perceptions of service performance (see Eq. 1 below).

Service Quality (SQ) = Customers’ Perceptions – Customers’ Expectations  

SERVQUAL is widely used for surveying customer satisfactions in many service industries. It is a tool used for demonstrating usefulness, and can be used comparatively for benchmarking purposes. SERVQUAL comprise five dimensions, as follows: (1) tangible: physical facilities, equipment, and appearance of personnel. (2) Reliability: ability to perform the promised service dependably and accurately. (3) Responsiveness: willing to help customers and provide prompt service. (4) Assurance: knowledge and courtesy of employees, and their ability to inspire trust and confidence. (5) Empathy: caring; individualized attention the firm provides its customer. These five dimensions, with 22 items of measurement, include: 4 items of tangibility, 5 items of reliability, 4 items of responsiveness, 4 items of assurance, and 5 items of empathy [8]. In this research, SERVQUAL would be used as initial factors of service quality in construction projects. Customer satisfaction is a measure of how products and services supplied by a company meet or surpass customer expectations [9]. Customer satisfaction is defined as the number of customers, or percentage of total customers, whose reported experience with a firm, its products, or its services exceeds specified satisfaction goals [9]. In construction, customer satisfaction means project owner satisfaction. The criteria for selecting a contractor is mainly based on price, the contractor’s technical capability, financial capability, and previous experiences of the contractor’s competence [9]. Sunindijo et al. [10] performed a research by using SERVQUAL to model the service quality of construction projects in Bangkok and surrounding areas. The research findings showed that the service quality comprised of four dimensions, including reliability, responsiveness, assurance and tangibility, respectively. Fischgrund and Omachonu [11] examined the quality gaps in construction projects by expanding on the previous gap analysis studies by Parasuraman, et al. [7]. The research identified 12 construction service quality gaps that are more nuanced than previous studies. One of the most interesting gaps is that between the project owner’s expectations and the project owner’s perceptions in construction service quality.
3. Research method

3.1. Identification of factors

The five dimensions with 22 items of measurement from SERVQUAL were used as initial factors and items information. In-depth interviews with experts were conducted within certain topic areas. This technique is designed as a group communication process of experts that aims to conduct detailed examinations and discussions of a specific issue. The process can be continuously iterated until a consensus is determined to have been achieved. This technique was used to confirm the factors and the items. All the factors were summarized, and a group of 3 experts in related fields was chosen, based on their experience, who included: a contractor with more than 20 years’ experience in the Thai construction industry, a project owner with more than 20 years’ experience, and an expert from an academic institution. All experts carefully and individually considered the listed factors for at least three times per expert until consensus was reached. The initial factors and items were improved and modified for construction service quality with suitability in regard to Thai culture, and one item was added to the list of 22. Once the listed factors were confirmed and categorized by the three experts, they were constructed and made ready for analysis. Factors and items are listed in table 1.

3.2. Questionnaire design

A questionnaire survey was designed for data collection to confirm the influential factors and items of the service quality of the provincial contractors by the project owners. The questionnaire comprised two parts, as follows: (1) demographics of the respondents as respondent’s position, type of project, type of project delivery and project value (4 questions). This part was measured by frequency (percentage) of the respondents. (2) 23 items of project owner’s perceptions (23 questions) and project owner’s expectations (23 questions), totaling 46 questions. This part was measured on a 5-level Likert scale from “strongly disagree” to “strongly agree”.

Table 1. Service Quality (SQ) questionnaire items.

| Factor         | Item                                                                 |
|----------------|----------------------------------------------------------------------|
| Service Quality: SQ | SQ1: Sufficient equipment and appearing ready to work.              |
|                 | SQ2: Sufficient manpower to complete assigned work.                  |
|                 | SQ3: Proper material storage and good housekeeping.                  |
|                 | SQ4: Workers dress properly, such as site safety wears.              |
|                 | SQ5: Tails of documents.                                             |
|                 | SQ6: Keeping promises.                                               |
|                 | SQ7: Showing sincerity when solving problems.                        |
|                 | SQ8: Performing work order as required.                              |
|                 | SQ9: Providing service at the time promised.                         |
|                 | SQ10: Always reporting work progress.                                |
|                 | SQ11: Informing the owner exactly when the service will be performed.|
|                 | SQ12: Providing prompt service to the project owner.                 |
|                 | SQ13: Willingness to help the project owner include additional work. |
|                 | SQ14: Behaviors of the workers instill confidence to the project owner.|
|                 | SQ15: Assuring the quality of work is up to standard.                |
|                 | SQ16: Politeness to the project owner.                               |
|                 | SQ17: Having the knowledge to answer the owners’ enquiries           |
|                 | SQ18: Having the competence to solve problems correctly               |
|                 | SQ19: Understanding the owner’s specific needs                       |
|                 | SQ20: Giving personal attention to the project owner                 |
|                 | SQ21: Providing maintenance services in the work that has been done. |
|                 | SQ22: Tidiness after work.                                           |
|                 | SQ23: Operating hours are convenient to the project owner.           |
3.3. Validity and reliability tests
To ensure the items in the questionnaire were appropriate for data collection, both validity and reliability tests were employed. Validity test: the interviews with the three experts regarding the identification of the factors confirmed the results. The experts reviewed and commented on whether the items were accurate representations to measure the service quality. They also suggested some items which were more appropriate in the context of the research. This exercise was useful in providing content validity and to ensure the items were neither ambiguous nor confusing. Reliability test: Cronbach’s alpha was used to evaluate the reliability of the questionnaire. A pilot study was conducted using 30 target samples (provincial contractors in target areas) to determine reliability. The 23 items (5-level Likert scale measurements) were tested by computer statistical software. The outputs gave the Cronbach’s alpha coefficient of 23 items in the project owner’s expectations of 0.932, and the project owner’s perceptions of 0.940, respectively. All coefficients were above 0.7, demonstrating that the questionnaire was reliable [12].

3.4. Data collection
Once the questionnaire was designed, a target group of the project owners was selected using a convenience non-probability sampling technique. The project owners must have had experience in hiring contractors (at least one project) for their construction projects. All of the respondents are project owners in four provinces. The projects are covered in the central area of north-east Thailand including Roi-ed, Khon Kaen, Maha Sarakham, and Karasin provinces, and the data collection period took 3 months. Face-to-face interviews were conducted to explain the details of the questionnaire and ensure that the respondents understood the aim of the survey. In total, 200 questionnaires were completed, but 68 were discarded due to incomplete or biased responses. As such, 132 questionnaires were recognized as valid and analyzed.

4. Results
4.1. Descriptive results
Table 2 shows demographics of the respondents, consisting of respondent’s position, type of project, type of project delivery and project value.

| Description                          | Frequency | Percentage |
|--------------------------------------|-----------|------------|
| **Respondent’s position**            |           |            |
| - Project owner                      | 92        | 69.7       |
| - Owner representative               | 40        | 30.3       |
| **Type of project**                  |           |            |
| - Single house                       | 61        | 46.2       |
| - Town house/Commercial building     | 23        | 17.4       |
| - Office building                    | 15        | 11.4       |
| - Factory/Warehouse                  | 16        | 12.1       |
| - Apartment building                 | 10        | 7.6        |
| - Others                             | 7         | 5.3        |
| **Type of project delivery**         |           |            |
| - Design-bid-build                   | 86        | 65.2       |
| - Design-build                       | 46        | 34.8       |
| **Project value**                    |           |            |
| - Less than1 M Baht                  | 19        | 14.4       |
4.2. Exploratory factor analysis

Exploratory Factor Analysis (EFA) is a statistical method for uncovering the underlying structure of a relatively large set of variables [13]. EFA is used to reduce the number of variables to a smaller set of underlying summary variables, called factors. In this research, EFA was implemented to determine the underlying structure of factors relating to the service quality of provincial contractors to owner satisfaction in construction projects in Thailand. The 23 variables of service quality (SQ) are equal to customers’ perceptions, minus customers’ expectations for each item. EFA was implemented with varimax rotation using computer statistical software, and the output showed: The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy = 0.943 (KMO>0.7) Tabachnik and Fidel, 2001) [14]. Bartlett’s test of sphericity had a significant value = 0.000 (less than 0.05) with approx. chi-square = 1856.565, df = 253. The extraction of EFA was based on initial Eigen values greater than 1 [15], as shown in table 3 on the following page, and the output analysis showed four components as the number of factors in this EFA. The percentage of explained variance was 60.48%. The EFA output showed that the 32 items were classified into three groups, as follows: factor 1: SQ7, SQ18, SQ6, SQ15, SQ9, SQ21, SQ19, SQ17, SQ22, SQ23 and SQ20 (11 items); factor 2: SQ10, SQ12, SQ11, SQ13, SQ14, SQ16 and SQ8 (7 items); factor 3: SQ3, SQ4, SQ5, SQ1 and SQ2 (5 items) respectively. Furthermore, the reliability of the questionnaire (all respondents) in terms of the three factors was assessed on the basis of Cronbach’s alpha coefficient. According to Nunnally [12], a Cronbach alpha coefficient of 0.7 or higher is recognized as acceptable. The values of the coefficient were acceptable for all three factors 1, 2 and 3, ranking from 0.932, 0.883, and 0.808, and the value of all items was 0.883. Table 3 shows the EFA results of factor analysis of service quality of provincial contractors to owner satisfaction in construction projects in Thailand.

| Item | Factor 1 | Factor 2 | Factor 3 | Cronbach's Alpha |
|------|----------|----------|----------|-----------------|
| SQ7  | 0.745    | 0.165    | 0.237    |                 |
| SQ18 | 0.730    | 0.156    | 0.267    |                 |
| SQ6  | 0.693    | 0.198    | 0.335    |                 |
| SQ15 | 0.678    | 0.365    | 0.255    |                 |
| SQ9  | 0.675    | 0.349    | 0.206    |                 |
| SQ21 | 0.661    | 0.328    | 0.277    | 0.932           |
| SQ19 | 0.653    | 0.298    | 0.261    |                 |
| SQ17 | 0.637    | 0.344    | 0.135    |                 |
| SQ22 | 0.630    | 0.381    | 0.42     |                 |
| SQ23 | 0.609    | 0.320    | 0.149    | 0.953           |
| SQ20 | 0.582    | 0.469    | 0        |                 |
| SQ10 | 0.232    | 0.747    | 0.297    |                 |
| SQ12 | 0.249    | 0.727    | 0.228    |                 |
| SQ11 | 0.229    | 0.718    | 0.263    |                 |
| SQ13 | 0.364    | 0.641    | 0.235    | 0.883           |
| SQ14 | 0.512    | 0.584    | 0.184    |                 |
| SQ16 | 0.422    | 0.505    | 0.143    |                 |
| SQ8  | 0.474    | 0.502    | 0.244    |                 |
| SQ3  | 0.344    | 0.159    | 0.717    | 0.808           |

Table 3. Factor loading and Cronbach’s alpha.
Table 3. Factor loading and Cronbach’s alpha.

| Item | Factor 1 | Factor 2 | Factor 3 | Cronbach's Alpha |
|------|----------|----------|----------|------------------|
| SQ4  | -0.052   | 0.374    | 0.711    |                  |
| SQ5  | 0.312    | 0.279    | 0.704    |                  |
| SQ1  | 0.413    | 0.111    | 0.575    |                  |
| SQ2  | 0.43     | 0.223    | 0.532    |                  |

Kaiser-Meyer-Olkin (KMO) = 0.943 (KMO>0.7), p-value = 0.000 (Sig.)

In this research, three factors were named by considering the majority of the items included in the factors, namely factor 1: empathy, factor 2: responsiveness, and factor 3: tangibles.

5. Conclusions
This research studied a factor analysis of service quality of provincial contractors to owner satisfaction in construction projects in Thailand. A total of 132 sample questionnaires, completed by project owners experienced in hiring contractors, were analyzed to confirm the factors. Respondent’s profiles are shown in table 4 on the following page. Factors relating to service quality in construction were identified and confirmed using the statistical technique of EFA. The research found three factors of service quality of the provincial contractors to owner satisfaction, as follows: (1) empathy: showing sincerity in solving problems, having the competence to solve problems correctly; keeping promises, assuring the quality of work is up to standard; providing the service at the time promised; providing maintenance service in the work that has been done; understanding the owner’s specific needs; having the knowledge to answer the owner’s enquiries; tidiness after work; operating hours are convenient for the owner; and giving personal attention to the project owner. (2) Responsiveness: always reporting the progress of work; providing prompt service to the owner; informing the owner exactly when the service will be performed; willingness to help the project owner including additional work; behavior of the workers to instill confidence in the project owner; politeness to the project owner; and performing work orders as required. (3) Tangibles: proper material storage and good housekeeping; workers dress properly; site safety implementation; details of documents; sufficient equipment; appearing ready to work; and sufficient manpower to complete the assigned work.

To recommend strategies for improving service quality in construction to the provincial contractors, the top three items in terms of factor loading were selected as a guideline to formulate the strategy for each factor. The recommended factors of service quality of provincial contractors to owner satisfaction in construction projects in Thailand are shown in table 4 below.

Table 4. Recommended factors of service quality of the provincial contractors.

| Service Quality | Empathy                         | Responsiveness                           | Tangibles                                      |
|-----------------|---------------------------------|------------------------------------------|------------------------------------------------|
|                 | - Showing sincerity in solving problems. | - Always reporting work progress. | - Proper material storage and good housekeeping.                     |
|                 | - Having the competence to solve problems correctly. | - Providing prompt service to the project owner. | - Workers dress properly, such as site safety implementation.             |
|                 | - Keeping promises.              | - Informing the project owner exactly when the service will be performed. | - Details of documents.                                                       |
The factors and items in table 4 above could be used as strategies for improving service quality of the provincial contractors to owner satisfaction in construction projects in Thailand, and for sustaining their business in the construction industry.

6. References

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