

Key dimensions of main contractors' service quality in the Chinese construction industry: Voices from subcontractors

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Abstract. While the topics of service quality and subcontracting are not new in construction project management, it seems that little is known how subcontractors perceive and evaluate the service quality of their main contractors. Particularly, evidence has shown that unfair subcontracting practices could lead to poor service quality; hence undesirable project outcomes. In addressing this gap, an online questionnaire survey of 90 subcontractors was undertaken to identifying the key dimensions of main contractors' service quality in the Chinese construction industry. Overall, the exploratory factor analysis shows that subcontractors' perception of main contractors' service quality could be classified into: operation management; health and safety management; and communication management. Of these, operation management is more prevalent than health and safety management and communication management. In conclusion, the research findings help inform company management of categories of key considerations, and thus enable them to configure better targeted strategies to improving their service quality.

1. Introduction

Evaluating and managing quality is one of the key drivers for effective project management in construction. Quality in construction can be defined as meeting the requirements of key stakeholders such as designers, constructors, regulatory agencies and owners [1]. According to Arditi and Gunaydin [1], construction quality could be classified into product and service quality. The former refers to the quality of materials, equipment, and technology involved in the construction of a building structure, while the latter (also known as the 'process quality') refers to the overall quality in which a project has been organised and managed through the project lifecycle [1]. Winch et al. [2] highlight that managing both product and service quality is vital for improving the overall performance of the industry and the competitiveness of construction firms. Of these, the authors share Ling and Chong's [3] argument that product quality is much easier to deal with than service quality, and that, to maintain a competitive edge over others, main contractors should engage in a continuous cycle of assessing their service quality and reconfiguring better strategies to meeting or exceeding their clients' expectations.

Ironically, even with the above recognition and the ongoing discourse for the construction industry to move towards less confrontational and more collaborative working practices, evidence has shown that the construction industry is still infested with subcontracting and service quality issues that have led to undesirable project outcomes. For example, Love et al.'s [4] study of 276 Australian construction projects has attested to an average cost overrun of 12.22%. Ahsan and Gunawan's [5] analysis of cost and schedule performance of international development projects has shown that the Chinese construction industry is one of the worst performers, with 13.6% and 5.4% of projects encountered time and cost overruns respectively. More recently, Siemiatycki [6] reports an average of



28% cost overrun in Canadian construction projects, and Ali [7] found that more than 20% of public and private projects in the Malaysian construction industry failed to meet the time requirements of their clients. In examining and mitigating service quality issues, researchers have often credited Parasuraman et al. [8] with their underlying foundation of service quality and their seminal 'SERVQUAL' framework, and adapted the SERVQUAL towards evaluating clients' perceived service quality of main contractors. For example, Hoxley [9] used the SERVQUAL in investigating the effects of fee tendering on the quality of consultancy services, and found that there are strong positive associations between UK clients' expectations and perceived service quality, and that fee tendering mechanism does not have significant effect on clients' perception of service quality. Subsequently, by adapting the SERVQUAL, his analysis of UK clients' perceived service quality of construction professionals has shown that service quality performance could be classified into dimensions of 'When', 'What', 'How' and 'Who' [10]. In US, Arditi and Lee [11-12] conceptualise Parasuraman et al.'s [8] preliminary 10 service quality factors with the quality function deployment methodology to developing a service quality performance management system for design-and-build contractors. In Singapore, Ling and Chong [3] adapts the 'SERVQUAL' to assessing the service quality of design-and-build contractors in public sector projects and found that clients' perceived service quality is much lower than their original expectations. Forsythe [13] builds on the SERVQUAL to developing a framework for assessing Australian housing contractors' service quality performance. More recently, Forsythe [14] refines his earlier framework of service quality for housing contractors and assessed clients' perceived service quality and satisfaction throughout the construction processes of residential projects. Despite all these efforts, it seems that little or no study has been done to explore subcontractors' perceived service quality performance of main contractors - particularly in the context of the China construction industry. This research is important because China's economy is growing at a considerable pace [15] and the competitive intensity and landscape of its construction industry are constantly changing [16]. By knowing these key dimensions of service quality, the Chinese construction contractors are expected to have a higher chance in surviving from such a competitive environment via an improved service quality [17].

2. Conceptual framework of service quality: Resource based view

In this study, a conceptual framework of perceived service quality has been developed based on the resource-based view of construction firms. According to Penrose [18-19], a firm is an entity that possesses unique collections of resources and capabilities bounded together in its administrative framework, and that 'ownerships' of these collections of resources and capabilities provide the basis for its strategy formulation and performance differential over its rivals. Of which, the performance differential could relate to main contractors' service quality. As such, following Parasuraman et al.'s [20] SERVQUAL, this study hypothesises that subcontractors' perceived service quality of their main contractors could be classified along the five dimensions of reliability, responsiveness, assurance, empathy and tangible.

'Reliability' refers to the ability of main contractors to perform promised services dependably and accurately [20], and represents the capability of them to finish the tasks specified in construction contracts. In accepting this, Betts and Ofori [21] and Cooke and Williams [22] define main contractors' reliability as their commitment to agreed construction planning and schedule, and argue that it is a critical factor for the successful delivery of construction projects. Ng et al. [23] expands this further by relating the reliability of main contractors to their interest and care for project stakeholders to help resolve problems. This is further reinforced by Maloney's [24] and Zhang et al.'s [25] argument that employees' readiness and commitment to providing professional and error-free construction services is the key characteristics of reliability.

The next dimension of 'responsiveness' represents the willingness of main contractors in attending to key stakeholders' requests in a timely manner. Howard et al. [26] supports the importance of main contractors' responsiveness in resolving project issues and argues that effective information-sharing is the key aspect of service quality in construction projects and that by having efficient and proper communication mechanisms, they will help mitigate the loss of information and the amount of rework; hence promoting better collaboration among different project stakeholders. Aksorn and Hadikusumo's

[27] analysis of construction service delivery in Thailand has further attested to the importance of proactive stakeholder engagement and communications, detailing that employees' communication skills and willingness to engage with key project stakeholders are strongly associated with the level of service quality perceived by key stakeholders.

Turning to the 'assurance' dimension, it refers to the knowledge, courtesy and passion of employees of construction firms towards delivering professional services [17]. Ling and Chong [3] and Lim and Loosemore [28] found that interpersonal and informational fairness are key towards creating a collaborative and no-blame work environment, and that the cooperative behaviour of project team members could help increase clients' overall satisfaction and perceived service quality performance of main contractors. In supporting this, Maqsood [29] relates 'assurance' to employees' knowledge and courtesy in addressing the doubts and concerns of key project stakeholders. Gordon and Akinci [30] operationalise the assurance aspect of service quality as main contractors' creativeness and competence towards developing and implementing contingency plans for successful delivery of projects.

The fourth dimension 'empathy' represents the personalised care and interest of main contractors on their stakeholders [17]. Ling and Chong [3] and Forsythe [13] maintain that main contractors' ability towards serving the best interest of their clients and giving them individualised care is one of the key drivers of improved client satisfaction and perceived service quality. This tends to support Sirisoontaropas' [31] assertion that demonstrating individual care to clients is a practice of empathy and that, by doing so, it will help attract repeated businesses with the clients. This collectively add weight to Kometa et al.'s [32] and Matzler and Hinterhuber's [33] conclusion that there are strong positive associations between main contractors' capabilities to understanding and fulfilling clients' needs and clients' satisfaction and perceived service quality performance.

Lastly, '*Tangibles*' refers to the appearance of physical facilities, equipment, personnel and communication materials [34]. Admittedly, the amount and quality of resources deployed by main contractors in construction projects could shape the perceptions of construction participants [35]. In supporting this, Slaughter [36] highlights that, although it is important for main contractors to possess abundant resources, the ways and processes that they implement and maintain those resources are of greater value to clients and would in turn affect their satisfaction and judgement on the overall service quality performance. More specifically, Hoxley [11] claims that employees' appearance could be deemed as an important criterion for professional service quality assessment in the UK construction industry. Furthermore, Liu [37] adds that the use of billboard hoardings and signages in promoting the construction company's experience and resources is a growing phenomenon towards improving the 'tangible' company image to general public.

3. Research Methods

The findings reported in this paper is part of a larger study undertook to investigate the subcontractors' perceived service quality of their main contractors in China. For this study, an online structured survey questionnaire, comprising three sections, was designed. In the first section, respondents were requested to provide their background information such as age, positions of their last project, duration of last project. Thereafter, they were required to rate 21 statements, on a 7-point Likert scale '1 – totally disagree, 7 -totally agree', relating to the main contractors' service quality. Lastly, they were also required to rate their overall satisfactory level on service quality delivered by their main contractors in the last project. See Table 1 for the measurement items of those five dimensions of service quality. Generally, the questionnaire was pretested, validated and amended before an industry-wide survey was undertaken. A simple random sampling method was adopted whereby the key informants of those subcontracting companies, which operate in the Zhejiang construction industry, were invited. The Zhejiang construction industry was selected mainly due to its considerable contribution to the national construction GDP of China and it comprises the greatest number of subcontracting firms [38].

Table 1. Measurement items of contractors' service quality

Code	Measurement items	Adapted from
RL1	The quality of their documentation works;	[3]
RL2	Their ability to fulfil the promises	[21]
RL3	Their manner of providing easy access to us to access their documentation	[23]
RS1	Their manner towards addressing our concerns and doubts	[3]
RS2	Their manner towards briefing us the latest progression about the project	[39]
RS3	Their manner of accommodative making adjustment for us to cope with changing circumstances	[27]
RS4	Their readiness in fulfilling our requirements on change orders	[27]
RS5	Their manner of keeping us informed of those decisions that affected our interest	[3]
A1	Their capability of dealing with unexpected situations	[3]
A2	Their contingency plans to cover the shortage of materials, equipment or labours	[30]
A3	Their attitude towards organising health and safety training and development programs for all on-site employees	[3]
A4	Their requirements on us in implying on-site health and safety supervisions	[3]
E1	Their capability of understanding both of our company's general and unique requirements	[13]
E2	Their capability of fulfilling both of our company's general and unique requirements	[32]
E3	They kept us informed of those decisions that affected our interest	[3]
E4	Their individual care for us	[40]
T1	Their capability of implementing up-to-date technologies in projects	[36]
T2	Their approaches towards organising health and safety training and development programs for all on-site employees	[3]
T3	The provision of on-site safety signs, and personal protective equipment (such as caps and vests)	[11]
T4	Their equipment and materials were up to date	[36]
T5	Their manner of providing us with information frequently and informally, and not only according to pre-specified agreement	[3]

Note: reliability (RL), responsiveness (RS), assurance (A), empathy (E), and tangible (T).

In this study, the exploratory factor analysis was conducted using SPSS to help reveal patterns of relationships between 21 measurement items of service quality. Three guidelines, suggested by Nunnally [41], were used to assess the convergent reliability and validity of measurement items within their respective dimensions: (i) factor loading must be at least 0.60; (ii) Cronbach's alpha coefficient must be at least 0.70; and (iii) cross factor loadings must be less than the primary factor loadings. In complementing the EFA findings, the relative prevalence indexing (RPI) method was adopted to facilitate the relative comparisons of items relating to main contractors' service quality. As suggested

by Loosemore and Lim [42], the RPI method can derive relative indices within the range of 0-1 for each item and therefore enable researchers to undertake relative comparisons of items.

4. Findings and discussions

A total of 90 valid responses were collected. Of these, most of respondent companies (53%) have been in operation for at least 20 years, and the average age of those respondent company is 14.78 years. Most of the respondent companies are in the area of structural construction (43.3%), followed by mechanical construction (13.3%) and site work (11.1%). In terms of the demographics of respondents, most of them (63.3%) have more than 10 years of experience in the industry, and an average work experience of 11.1 years is obtained. Furthermore, most of the respondents hold executive roles in their companies. Collectively, these show that the respondents are experienced and thus their responses could be deemed valid and reliable.

Table 2 summarises the EFA results for perceived service quality of main contractors. Three components emerge from the 14 measurement items during the initial EFA process, with a KMO and Bartlett's test value of 0.929. The eigenvalues, percentage of variance explained, and Cronbach alpha obtained for these three components were ranged from, 1-14, 0.62-0.65 and 0.862-0.959 respectively. The RPIs of each item ranging from 0.672 to 0.754. Of the 21 measurement items, seven (i.e. RL1, RS2, RS3 A3, T4, E4, and RL3) have factor loadings of less than 0.60, and thus were considered as inconsistent and deleted sequentially in subsequent EFA processes.

Overall, following the iterative trimming process, 14 measurement items were found to satisfactorily characterise three components, with factor loadings of at least 0.6. Further, the Cronbach alpha values for the three components have improved considerably, thus indicating the model is convergent valid.

Table 2. Rotated component matrix for re-trimmed service quality

	RPI	Component		
		1	2	3
T1	<u>.724</u>	<u>.844</u>	.228	.261
A1	<u>.743</u>	<u>.859</u>	.239	.269
E1	<u>.724</u>	<u>.748</u>	.332	.398
E2	<u>.708</u>	<u>.759</u>	.244	.398
A2	<u>.732</u>	<u>.710</u>	.486	.212
RL2	<u>.732</u>	<u>.702</u>	.550	.205
T2	<u>.744</u>	<u>.611</u>	.534	.150
RS1	<u>.722</u>	<u>.701</u>	.497	.258
T3	<u>.743</u>	.245	<u>.908</u>	.198
E3	<u>.672</u>	.275	<u>.700</u>	.512
A4	<u>.754</u>	.403	<u>.768</u>	.148
RS4	<u>.692</u>	.261	.310	<u>.794</u>
RS5	<u>.738</u>	.513	.136	<u>.633</u>
T5	<u>.730</u>	.209	.136	<u>.866</u>

In terms of the three constructs, the first dimension comprises measurement items that characterise main contractors' operational management capability of implementing up-to-date technology (T1), being flexible (RL1), understanding subcontractors' requirements (A3), addressing subcontractors' concerns (A4), dealing with unexpected situations (RL2), and organising training and developing programs (RS3). Collectively, this dimension accounts for 65.1% of the variance explained with the

eigenvalue of 9.11. According to Charvat [43], all these capabilities demonstrate the contractors' craft in controlling and managing a project. Hereafter, this dimension is named 'operation management'. Among these eight measurement items, T2 was found to have the highest RPI of 0.744, followed by A1 (RPI=0.743), A2 and RL2 (RPI=0.732), T1 and E1 (RPI=0.724), RS1 (RPI=0.722), and E2 (RPI=0.708). An average of RPI of 0.729.

In terms of the second dimension of service quality, it demonstrates the main contractors' health and safety management skills and their gestures in showing individual care towards subcontractors (i.e. T3, E3, A4). Thus, 'health and safety management' is used as the name of the new dimension. This dimension accounts for 8.35% of the variance explained with the eigenvalue of 1.17. Out of the three measurement items, A4 is found to have the highest RPI of 0.754, while E3 has the lowest in this dimension (RPI=0.672). The average RPI of these three measurement items in this dimension is of 0.723. indeed, A4 is found to have the highest RPI not only in this dimension but in all these 14 measurement items, while E3 is also found to have the lowest RPI out of all these measurement items. It shows that, during the service delivery, main contractors are more content with their requests on subcontractors implying onsite health and safety management than informing subcontractors the decisions that may affect their interests.

The third dimension illustrates the main contractors' capabilities in communicating with their subcontractors. Among these measurement items in this dimension, prepared in fulfilling change orders (RS3), kept subcontractors informed with these decisions may affect their interest (RS5), and frequently and proactively provide subcontractors information (T4) have been utilised by previous studies in investigating the main contractors' communication management. This dimension accounts for 7.04% of the variance explained with the eigenvalue of 1.10. The average RPI of measurement items from this dimension is 0.720, lowest of these three dimensions. Among the three measurement items, RS5 has the highest RPI of 0.738 and RS4 has the lowest of 0.692. T5 is found to have the RPI of 0.730.

5. Conclusion and limitation

This paper answers the research question by identifying the key dimensions of the main contractors' service quality. However, the hypothesis of service quality having five dimensions is not supported by this study. This study found that, from the subcontractors' perceptions, service quality delivered by main contractors in the Chinese construction industry can be categorised into three dimensions, namely: operation management, health and safety management, and communication management. The improvement of main contractors' service quality can be achieved via the effective utilisation of resources and capabilities to boost the above-mentioned three dimensions. Among these three dimensions, operation management has higher average RPI (0.729) than the other two (0.723 for health and safety management and 0.720 for communication management).

One limitation is the sample frame and size of this study. Considering the huge number of construction companies in China, this study only targeted companies operating in the Zhejiang construction industry. However, the sample size of 90 responses (out of 30,000 invites sent) is considered as relatively small and could restrict the capability of detecting significant findings. Further interviews or case studies are recommended to validate the findings of this research in the context of Chinese construction industry.

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