Service quality for architects: scale development and validation

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Abstract

Purpose – The purpose of this paper is to develop and explain an empirically validated scale to measure service quality for architects in India.

Design/methodology/approach – This study applies a systematic procedure for development of a psychometric scale in three phases. Phase 1 includes item generation and selection through review of literature and expert opinion. Phase 2 comprises scale refinement using item analysis and exploratory factor analysis. Phase 3 applies confirmatory factor analysis (CFA) for establishing convergent, discriminant and nomological validity. This study has involved 15 expert participants in Phase 1 and sought participation from 250 respondents using an online questionnaire in two other independent phases.

Findings – The findings of the empirical study resulted in the development of a 22-item scale that measures the constructs such as design quality, project administration quality, communication quality, relationship quality and dependability quality.

Research limitations/implications – This study has developed a context-specific psychometric scale of service quality for architects in India using snowball sampling. Although this study identified five valid service quality factors, the classified information relating to the formation of expectations was not collected.

Practical implications – This reliable and valid scale would be helpful for architects to measure the level of service quality in enhancing business performance. This study has established that service quality for architects is achieved only when the perceived benefits are available from the aspects like design, project administration, communication, relationship and dependability.

Social implications – This study can facilitate an architect interested in opportunities relating to contracting, consulting and engineering to explore possibilities of higher fees from clients.

Originality/value – This study is an original attempt in developing a validated tool to measure service quality of architects in India.

Keywords Design, Architecture, Management, Integrated practice

Paper type Research paper

1. Introduction

In architecture, uncertainty and turbulence in a business environment may bring progressive sophistication in design and construction. Such complexities arise principally because of changes within the construction sector and advances in numerous innovative technologies (Alharbi *et al.*, 2015). Although the modern advances in architecture in India owe a great deal to the western architectural styles of the twentieth century since the Second World War (Colquhoun, 2002), these dynamics in changes and advances might reshape the character of service quality for architects. Service quality is being considered parallel to the increasing dominance of the services sector in an economy aspiring to meet growth needs (Forsythe, 2016).

Further, regardless of these complexities, architects typically make the initial decision on the construction type appropriate for a built project in India (Deobhakta, 1997). Several pieces of information are required to determine the type of construction needed. Many a times, the required information is not included in the content of building codes and regulations, as it is considered to be advisory (Baird, 2010). Often, the advisory solutions are

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not documented in a way that allows their use as law (Wates, 2014). This results in challenges in planning and designing work for architects in India; a country which is a booming economy attracting productive investment flows in areas like construction, real estate, infrastructure and similar other projects. Yet the profession of architecture in globalized India is restricted to a handful of architects belonging to a specialized architectural wing of civil engineering, whose numbers are not more than 60,000 in a population of over 1.25 billion (Khan, 2016). This turns out to be only 48 architects for each million residents in India.

Given the magnitude coupled with the variety of buildings to be constructed in developing India, it is an exciting time to be an architect, only if opportunities and challenges are embraced with adequate service quality. The study on service quality for architects in India can be beneficial from two perspectives; first, it will contribute to realize the true potential of their discipline; second, it pre-empts faulty architectural planning (Day and Barksdale, 1994). Further, service quality can benefit architects in other ways as well like from promoting themselves to providing clients a positive experience (Baker and Lamb, 1994). However, an empirically validated scale to measure service quality of architects is not found in the extant literature. To fill this major research gap, this study attempts to develop and explain an empirically validated psychometric scale to measure service quality for architects in India based on responses from the users of architectural services like contractors, developers, consultants and owners of commercial and industrial real estate.

This paper is organized into four major sections. In the first section, a systematic review of literature on service quality has been presented. The second section discusses a standard scale development procedure for developing an empirically validated psychometric scale. The results of the study are discussed in the third section. The study concludes in the last section with research contributions, implications, limitations and directions for the future research.

2. Review of literature

Johnston (1999) defined service quality as "customers' overall impression of an organization's services in terms of relative superiority or inferiority." Furthermore, literature on evaluation of service quality is overwhelmed with a wide variety of attributes. Grönroos (1982) with the Nordic way of thinking suggested two factors for service quality namely, "technical quality" and "functional quality." Parasuraman *et al.* (1985) with the American way of thinking initially suggested ten dimensions to evaluate service quality, which were perhaps the most widely accepted dimensions. Later in 1988, Parasuraman *et al.* fine-tuned these ten into five dimensions in their SERVQUAL survey instrument namely "tangibility," "reliability," "responsiveness," "assurance," and "empathy." Parasuraman *et al.* (1985, 1988) argued that the service delivery process can be broken down into specific stages to be measured according to the gaps in customer perceptions when benchmarked against customer expectations for measuring service quality. Despite critical debate about SERVQUAL (Babakus and Boller, 1992; Brown *et al.*, 1993; Carman, 1990; Cronin and Taylor, 1992, 1994; Parasuraman *et al.*, 1991, 1993, 1994a, b; Teas, 1993), it has retained its longevity and endurance due to its psychometric advantages to diagnose service quality in comparison to competing instruments like SERVPERF (Cronin and Taylor, 1994; Cronin *et al.*, 2000; Jain and Gupta, 2004).

One of the earliest applications of service quality in the construction industry was seen in analyzing its behavioral determinants in the real estate brokerage industry (Johnson *et al.*, 1988). In the past, only Baker and Lamb (1994) had attempted to determine what specifically constituted service quality in the context of commercial architectural design gathering data from in-depth interviews with just 11 subjects where participants were asked to expand on what they meant by fine-tuned five dimensions of SERVQUAL. New practices are emerging in architecture, engineering and construction comprising real estate and infrastructure known as integrated practice. This practice facilitates architects, engineers, construction managers, and contractors to work together either as fully integrated firms or in multi-firm partnerships. Therefore, this study reviews service quality with reference to the integrated practice in the construction industry.

As research in the realm of service quality in the integrated construction industry started to see the emergence of conceptual frameworks since 1994, this study intends to review 30 notable studies from this time. Therefore, this review includes the works of (SQ01) Baker and Lamb (1994), (SQ02) Samson and Parker (1994), (SQ03) Nelson and Nelson (1995), (SQ04) Buttle (1996), (SQ05) Preece and Tarawneh (1997), (SQ06) Winch *et al.* (1998), (SQ07) Garland *et al.* (1999), (SQ08) Holm (2000a), (SQ09) Holm (2000b), (SQ10) Hoxley (2000), (SQ11) Love *et al.* (2000), (SQ12) Siu *et al.* (2001), (SQ13) Maloney (2002), (SQ14) Arditi and Lee (2003), (SQ15) Arditi and Lee (2004), (SQ16) Dabholkar and Overby (2005), (SQ17) Sui Pheng and Hui Hong (2005), (SQ18) Oliver (2006), (SQ19) Marja Rasila and Florian Gersberg (2007), (SQ20) Forsythe (2007), (SQ21) Forsythe (2008), (SQ22) Tuzovic (2009), (SQ23) Seiler and Reisenwitz (2010), (SQ24) Araloyin and Olatoye (2011), (SQ25) Forsythe (2012), (SQ26) Lai and Lai (2013), (SQ27) Sunindijo *et al.* (2014), (SQ28) Forsythe (2015), (SQ29) Eldejany (2016), and (SQ30) Forsythe (2016). Note that SQ stands for studies in "service quality with reference to the integrated construction industry", and it has been chronologically serialized from SQ01 to SQ30 for the purpose of tabulation (Table I).

These notable studies have been assumed to be developed sequentially, providing a continuous updation and learning from the findings of the predecessors to draw issues suitable for comparative evaluation. As the application of service quality to the integrated construction industry seems to be quite broad, the following 17 issues are considered suitable for comparative evaluation of these notable studies:

(1) involves architects;

(2) involves construction engineers and managers;

(3) involves contractors;

(4) involves customers;

(5) involves tenants;

(6) reviews prior literature;

(7) hierarchical representation to achieve original service quality measurement;

(8) hierarchical representation to use SERVQUAL-based dimensions;

(9) reports of exploratory factor analysis (EFA);

(10) reports of confirmatory factor analysis (CFA);

(11) empirical research involving anecdotal evidence/examples;

(12) empirical research involving descriptive reporting of overview;

(13) empirical research using case study;

(14) empirical research involving hypotheses testing;

(15) adequate theoretical foundations for postulated structural relations;

(16) develop a link for measurement of customer satisfaction; and

(17) develop a link for measurement of patronage intension.

Time Line	19 94 SQ	19 94 SQ	19 95 SQ	19 96 SQ	19 97 SQ	19 98 SQ	19 99 SQ	20 00 SQ	20 00 SQ	20 00 SQ	20 00 SQ	20 01 SQ	20 02 SQ	20 03 SQ	20 04 SQ	20 05 SQ	20 05 SQ	20 06 SQ	20 07 SQ	20 07 SQ	20 08 SQ	20 09 SQ	20 10 SQ	20 11 SQ	20 12 SQ	20 13 SQ	20 14 SQ	20 15 SQ	20 16 SQ	20 16 SQ
Issue No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
(1)	✓	✓		✓	✓					✓	✓	✓					✓		✓											
(2)		✓		✓	✓		✓			✓	✓	✓					✓		✓											
(3)				✓	✓		✓						✓	✓	✓															
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(5)									✓										✓		✓	✓	✓	✓	✓	✓		✓		✓
(6)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(7)				✓					✓													✓					✓		✓	
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(13)										✓	✓			✓	✓	✓	✓		✓									✓		
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(17)																											✓		✓	

Note: The markings "✓" denote that the issues (in rows) are present in particular study's model (in columns)

Table I.
Evaluation of service quality studies in the domain of integrated construction industry

The findings of evaluation of service quality studies are presented in Table I. An extensive and interesting literature on the measurement of service quality has emerged since 1994. Some essential learning points are as follows:

- Several authors have suggested that service quality is a hierarchical construct. However, very few like Sunindijo *et al.* (2014) have attempted for original measurement for construct service quality.
- Almost all studies have made an attempt to review prior literature relating to service quality in the domain of integrated practice.
- Most of the empirical studies since 2008 have involved tenants and customers as respondents in applying hierarchical representation using SERVQUAL-based dimensions.
- Only Sunindijo *et al.* (2014) applied EFA in the domain of integrated construction industry.
- No study has been reported so far using CFA showcasing psychometric properties of the service quality scale.
- Although some studies have attempted to develop a link for measuring customer satisfaction and patronage intension, only recently adequate theoretical foundations have been seen postulated for structural relations among constructs relating to service quality (Sunindijo *et al.*, 2014; Eldejany, 2016).

As most of these studies are tailored to suit the context of specific markets in construction industry such as building maintenance, engineering, building surveying, housing refurbishment and real estate, there is a need to do a study for service quality of architects. Just specific to service quality of architects, only the study by Baker and Lamb (1994) has been found to be of high relevance. Consequently, an emphasis has been placed on their adaption of SERVQUAL assured with adequate psychometric advantages.

3. Methodology

This study employs the scale development paradigm of Churchill (1979) which got augmented subsequently by Nunnally *et al.* (1994), and Patyal and Koilakuntla (2015). This study has divided the procedure of scale development into three independent phases. The procedure has been shown in Figure 1.

Phase 1 makes a qualitative inquiry that includes item generation and selection through a review of literature and expert opinion. Phase 2 deals with scale refinement using EFA and reliability analysis. For the pilot study involving EFA, a non-probabilistic snowball sampling method is adopted and a total of 250 respondents were approached, of which 115 useful responses were obtained, corresponding to a response rate of 46 percent. Phase 3 deals with scale validation that applies CFA for establishing convergent, discriminant and nomological validity. In phase 3, the snowball sampling method was adopted again to approach a total of 250 independent respondents, of which 160 useful responses were obtained, corresponding to a response rate of 64 percent. The target respondents in both phases were ensured to be users of architectural services like contractors, developers, consultants and owners of commercial and industrial real estate. Table II depicts the profile of these respondents in Phase 2 and Phase 3.

3.1 Phase 1: qualitative inquiry

3.1.1 Conceptual definitions. This is the first step in the development of an instrument of service quality for architects. The items of service quality for architects were adopted after a systematic review of the literature. In order to keep similar level of understanding about the

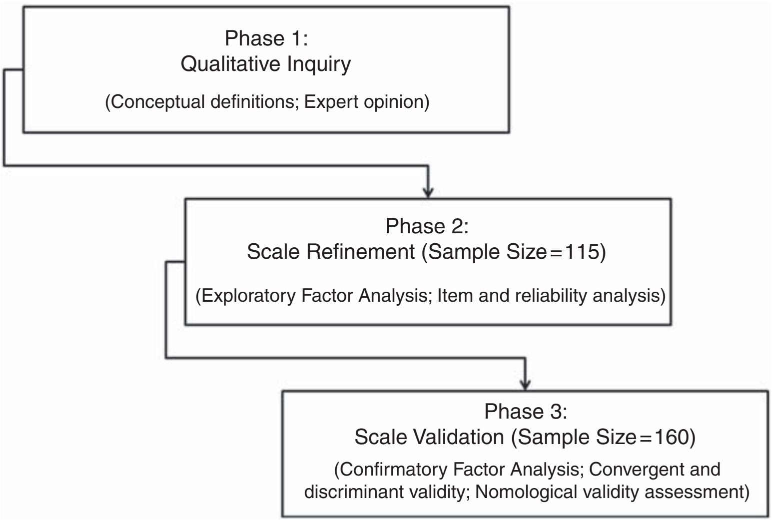

Figure 1.
Systematic procedure of scale development

construct "service quality" for respondents, most of the measures were initially taken from Baker and Lamb (1994), which comprised 19 items of tangibles, 13 items of reliability, eight items of responsiveness, 16 items of assurance and 15 items of empathy as process or functional dimensions of service quality for architectural design firms. The study of Baker and Lamb (1994) also subjectively grouped 17 items as outcome or technical dimensions of service quality for architectural design firms comprising four categories: function (five items), appearance (six items), maintenance (two items), and other (four items). This classification of service quality comprising two dimensions, namely, process related and outcome related was motivated by Grönroos (1990, p. 37). However, aspects of process quality were seen to be motivated by Parasuraman *et al.* (1988). This was a crucial step in this research as it intends to develop or select a conceptual definition for service quality of architects. Accordingly, "service quality of architects" has been defined as the gap stemming from perceptions and expectations due to performance of an architectural service. This conceptual definition is intended to provide a theoretical base underlying the scale for service quality of architects.

3.1.2 Expert opinion. Initially, the study involved 85 items including 71 items of process dimension of service quality for architectural design firms in the study of Baker and Lamb (1994). The other 14 items have been included after an interaction with the key faculty at National Institute of Construction Management and Research in Pune. This designed scale was subjected to review by five experts to verify its content validity. The review by the panel of these five experts helped in shaping comprehensive and noteworthy items to study service quality for architects in the context of India. This review allowed 45 of the total 85 items to be noteworthy. Further, the remaining items to study service quality were pre-tested with a group of another ten expert participants. These ten experts included five academicians involved in the area of service operations management and who had been publishing research papers for over 15 years in journals of repute. They also held responsible positions like director, dean or head of department in their respective organizations. This panel was further enriched by five expert architects who had been registered with the Council of Architecture under the Architects Act 1972 for over 20 years having experience in the field of feasibility studies, architectural programming and project management. Each of these ten experts was asked to assess remaining 45 items to study

Table II.
Profile of respondents

Description	Second phase	Third phase
Total number of respondents	115 (100%)	160 (100%)
Education		
Graduate	10 (8.7%)	15 (9.4%)
Post graduate	100 (87.0%)	139 (86.9%)
Doctorate	5 (4.3%)	6 (3.8%)
Age		
Less than 35 years	71 (61.7%)	105 (65.6%)
35–45 years	36 (31.3%)	44 (27.5%)
45–60 years	8 (7.0%)	10 (6.3%)
60 years or older	–	1 (0.6%)
Gender		
Male	90 (78.3%)	132 (82.5%)
Female	25 (21.7%)	28 (17.5%)
Experience in the construction industry		
Less than 3 years	14 (12.2%)	19 (11.9%)
3–5 years	19 (16.5%)	24 (15.0%)
5–10 years	34 (29.6%)	52 (32.5%)
More than 10 years	48 (41.7%)	65 (40.6%)
Primary liking of clients		
Developers or builders	46 (40.0%)	61 (38.1%)
Commercial building sponsors	23 (20.0%)	35 (21.9%)
Industrial building owners	10 (8.7%)	13 (8.1%)
Individual sponsors	12 (10.4%)	18 (11.3%)
Infrastructure contractors	18 (15.7%)	26 (16.3%)
Government	6 (5.2%)	7 (4.4%)
Net worth of handled projects in last year		
Rs. 1–5 million	11 (9.6%)	18 (11.3%)
Rs. 5–10 million	12 (10.4%)	18 (11.3%)
Rs. 10–20 million	16 (13.9%)	20 (12.5%)
More than Rs. 20 million	76 (66.1%)	104 (64.9%)
Liking of projects (with multiple selection)		
Commercial building	83 (72.2%)	120 (75.0%)
Residential building	72 (62.6%)	107 (66.9%)
Bungalow	87 (75.7%)	139 (86.9%)
Industrial Building	81 (70.4%)	104 (65.0%)
Specializations of interest (with multiple selection)		
Air conditioning	28 (24.3%)	37 (23.1%)
Automatic control systems and computer networks	14 (12.2%)	26 (16.3%)
Electrification	17 (14.8%)	26 (16.3%)
Fire protection systems	18 (15.7%)	27 (16.9%)
Prediction and estimation	61 (53.0%)	87 (54.4%)

service quality for architects in support of readability, bias, understanding, ambiguity and appropriateness for relevance to architectural settings in India. Accordingly, their suggested and finalized 30 items were used for scale refinement in phase 2 of this study.

3.2 Phase 2: scale refinement

This phase covers the pilot testing, as shown in Figure 1. For pilot testing, a questionnaire of 30 items was prepared and evaluated on a five-point Likert scale (where 1 – "not agree at all," 2 – "mostly disagree," 3 – "neither agree nor disagree," 4 – "mostly agree," and 5 – "completely agree"). The questionnaire was divided into two sections, where the first section consisted of classification questions pertaining to education, age, gender, experience in the construction industry, primary liking of client to work within, net worth of handled projects in the last year, liking of projects (with multiple selection) and specializations of interest (with multiple selection). The second section was formed of 30 items finalized in phase 1. A sample size of 115 respondents from users of architectural services was used for pilot testing of the items following steps suggested by Churchill (1979). The complete refinement of the scale was ensured through EFA followed by item and reliability analysis. The procedure for scale refinement has been described in the following section.

3.2.1 EFA. This study applied principal component analysis using Varimax rotation for conducting EFA on 30 finalized service quality items to extract factors using SPSS 14.0 software. The EFA resulted in a six-factor model with eigen value greater than 1. These six factors were to be dimensions of service quality for architects. They accounted for 61.148 percent variance with Kaiser-Meyer-Olkin (KMO) value as 0.837. For authentic results of factor analysis, the value of KMO must be greater than 0.600 (Tabachnick and Linda, 2012). This suggests appropriateness of data for grouping into a smaller set of underlying factors (Kwofie *et al.*, 2016). Further, Bartlett's test of sphericity was also significant ($p < 0.01$). Furthermore, a loading of 0.50 or greater on the factor was considered good for sample size up to 120 for EFA (Hair *et al.*, 2010) because of which "be enthusiastic," "display and communicate ideas clearly," "adhere the budgets," "take initiative to offer suggestions," and "have adequate full time permanent employees" were dropped in the first phase (see, Table III). Finally, a total of 25 items for all the six factors as shown in Table III were retained in this phase.

3.2.2 Item and reliability analysis. Nunnally (1994) reported that the threshold value of Cronbach's α must be at least 0.60 and is considered highly reliable beyond 0.70. The present study used this technique for internal consistency in determining the reliability separately for each factor pertaining to service quality of architects using the SPSS 14.0. The strong evidence of reliability was ensured in the developed scale after dropping the delivery quality factor as shown in Table III.

3.3 Phase 3: scale validation

After the scale refinement phase, the scale validation process was followed as shown in Figure 1. For scale validation, the replication of the confirmatory factor model was done in an independent sample to check for convergent, discriminant and nomological validity. The steps of the scale validation phase are as follows.

3.3.1 CFA. CFA is the next step after reliable EFA to determine the validated factor structure of the data set with principal axis factoring method using Varimax rotation. Further, a loading of 0.45 or greater on the factor was considered good for sample size up to 160 for CFA (Hair *et al.*, 2010). Accordingly, an item labeled as "develop a well-balanced tender document" was deleted for having factor loading less than 0.45 (Table IV). Then confirmatory factor measurement model for the present study was developed using AMOS 6.0.0 and maximum likelihood method of estimation was performed for the entire set of remaining items. This measurement model was evaluated by examining the goodness-of-fit indices and factor loadings. The goodness-of-fit indices of the measurement model appear as ($\chi^2 = 730.193$, $p = 0.000$, $\text{df} = 314$, $\chi^2/\text{df} = 2.325$, $\text{CFI} = 0.864$, $\text{TLI} = 0.848$, $\text{IFI} = 0.865$, $\text{RMSEA} = 0.091$). Suggested value of χ^2/df is between 1.0 and 3.0 because small values (<1.000) can indicate an over-fitted model while high values (>3.000) can indicate an under-parameterized model. Incremental fit indices (CFI, IFI, and TLI) range from 0 (no fit at all) to 1.0 (perfect fit), and an acceptable decision

	Mean	SD	Factor loading (communalities)	Eigen value	Chronbach's α
Factor 1: design quality				10.248	0.8544
1. Choose appropriate material and construction to specification	4.487	0.8096	0.719 (0.647)		
2. Provide appropriate functionality in building design	4.669	0.6313	0.675 (0.565)		
3. Develop accurate design documents	4.573	0.7499	0.655 (0.691)		
4. Provide space flexibility for accommodating future changes	4.356	0.8500	0.645 (0.588)		
5. Have a solution orientation in design	4.495	0.6802	0.644 (0.682)		
6. Maintain coordination between drawings	4.687	0.5676	0.591 (0.661)		
Factor 2: project administration quality				2.333	0.7615
1. Administer contracts meticulously	3.834	1.2420	0.749 (0.629)		
2. Obtain fast statutory approvals	4.078	1.0853	0.711 (0.701)		
3. Settle claims	3.052	1.3691	0.660 (0.545)		
4. Develop a well-balanced tender document	3.678	1.2034	0.523 (0.628)		
Factor 3: communication quality				1.687	0.7576
1. Listen requirements of clients	4.695	0.5646	0.732 (0.660)		
2. Seek and use cutting edge information for quick response	4.347	0.7014	0.716 (0.740)		
3. Document all the changes in the project	4.443	0.7857	0.614 (0.529)		
4. Pay attention to details for client requirements	4.704	0.4951	0.572 (0.592)		
5. Be enthusiastic#	4.513	0.6538	0.458 (0.577)		
Factor 4: relationship quality				1.532	0.8024
1. Exercise honesty and integrity	4.643	0.5951	0.772 (0.703)		
2. Be trustworthy	4.713	0.5737	0.637 (0.644)		
3. Be polite and friendly	4.217	0.9059	0.598 (0.621)		
4. Have a harmonious relationship with stakeholders	4.382	0.7560	0.581 (0.618)		
5. Demonstrate commitment to a project approach in implementation	4.339	0.8774	0.524 (0.693)		
Factor 5: dependability quality				1.399	0.7312
1. Make creative use of space and offer esthetics in their designs	4.626	0.6277	0.643 (0.630)		
2. Adhere timelines	4.504	0.7651	0.589 (0.645)		
3. Make quick and responsible decisions.	4.426	0.6360	0.580 (0.529)		
4. Anticipate and resolve problems	4.513	0.7177	0.546 (0.565)		
5. Display and communicate ideas clearly#	4.773	0.4786	0.459 (0.603)		
6. Adhere the budgets#	4.417	0.8269	0.446 (0.498)		
Factor 6: delivery quality				1.147	0.4930
1. Educate clients	4.017	0.9821	0.695 (0.550)		
2. Ensure appropriate furnishings and finishes of the space	4.434	0.8071	0.665 (0.684)		
3. Take initiative to offer suggestions#	4.313	0.7764	0.427 (0.498)		
4. Have adequate full time permanent employees#	4.139	0.9165	0.381 (0.430)		

Note: #Dropped measurement item in Table III

Table III. Descriptive statistics and test of reliability

rule is to accept the fit as moderate for values above 0.80 and good for values above 0.90 (Hair *et al.*, 2010). Finally, the RMSEA value of 0.091 represents reasonable model fit (Hair *et al.*, 2010; Prakash *et al.*, 2011).

3.3.2 Convergent and discriminant validity. It is absolutely necessary to establish convergent and discriminant validity, as well as reliability, when doing a CFA. All of these can be established using input as standardized residuals and modification indices, which results from the successful execution of the measurement model. For establishing convergent validity, the threshold value of composite reliability, average variance extracted (AVE), and MaxR(H) is 0.700, 0.500, and 0.800, respectively such that CR > AVE

	Mean	SD	Factor loading (communalities)	Chronbach's α
Factor 1: (DQ) design quality				0.8301
1. (DQ1) Choose appropriate material and construction to specification	4.543	0.7676	0.726 (0.527)	
2. (DQ2) Provide appropriate functionality in building design	4.675	0.5992	0.711 (0.505)	
3. (DQ3) Develop accurate design documents	4.568	0.7575	0.754 (0.569)	
4. (DQ4) Provide space flexibility for accommodating future changes	4.368	0.8513	0.514 (0.365)	
5. (DQ5) Have a solution orientation in design	4.487	0.6820	0.707 (0.499)	
6. (DQ6) Maintain coordination between drawings	4.668	0.5797	0.686 (0.470)	
Factor 2: (PAQ) project administration quality				0.7759
1. (PAQ1) Administer contracts meticulously	3.881	1.2150	0.833 (0.693)	
2. (PAQ2) Obtain fast statutory approvals	4.112	1.0093	0.718 (0.515)	
3. (PAQ3) Settle claims	3.156	1.3390	0.668 (0.447)	
4. Develop a well-balanced tender document##	3.706	1.1304	0.408 (0.167)	
Factor 3: (CQ) communication quality				0.7046
1. (CQ1) Listen requirements of clients	4.656	0.6147	0.612 (0.374)	
2. (CQ2) Seek and use cutting edge information for quick response	4.306	0.7354	0.523 (0.324)	
3. (CQ3) Document all the changes in the project	4.450	0.7834	0.563 (0.317)	
4. (CQ4) Pay attention to details for client requirements	4.650	0.5517	0.817 (0.667)	
Factor 4: (RQ) relationship quality				0.7730
1. (RQ1) Exercise honesty and integrity	4.643	0.5865	0.676 (0.457)	
2. (RQ2) Be trustworthy	4.718	0.5737	0.502 (0.352)	
3. [RQ3] Be polite and friendly	4.262	0.8722	0.692 (0.478)	
4. (RQ4) Have a harmonious relationship with stakeholders	4.412	0.7472	0.696 (0.485)	
5. (RQ5) Demonstrate commitment to a project approach in implementation	4.406	0.8187	0.648 (0.420)	
Factor 5: (DEQ) dependability quality				0.7155
1. (DEQ1) Make creative use of space and offer esthetics in their designs	4.556	0.7070	0.479 (0.329)	
2. (DEQ2) Adhere timelines	4.518	0.7178	0.688 (0.474)	
3. (DEQ3) Make quick and responsible decisions	4.406	0.6849	0.770 (0.593)	
4. (DEQ4) Anticipate and resolve problems	4.550	0.6986	0.566 (0.321)	

Note: ##Dropped measurement item in Table IV

Table IV. Scale Purification

(Hancock and Mueller, 2001; Hair *et al.*, 2010) (Table V). Further, for establishing discriminant validity, both maximum shared variance (MSV) and average shared variance (ASV) should be less than that of AVE (Bagozzi *et al.*, 1991; Hair *et al.*, 2010) (Table V).

3.3.3 Nomological validity assessment. Nomological validity relates to the principles that resemble laws, especially the laws of nature which are neither logically necessary nor theoretically explicable, but just are so. This validity has been supported by demonstrating

Constructs	CR	AVE	MSV	ASV	MaxR(H)	(1)	(2)	(3)	(4)	(5)
(1) Relationship quality	0.873	0.545	0.267	0.126	1.064	0.738				
(2) Design quality	0.950	0.554	0.274	0.450	0.856	0.517	0.745			
(3) Project administration quality	0.910	0.722	0.095	0.076	0.741	0.262	0.308	0.850		
(4) Communication quality	0.855	0.551	0.178	0.108	1.037	0.256	0.368	0.229	0.743	
(5) Dependability quality	0.862	0.566	0.274	0.116	1.020	0.484	0.523	0.215	0.422	0.752

Table V. Measurement model: CR, AVE, MSV, and ASV that the constructs are related to other constructs included in the model in a manner that supports highly significant predictive assessment at the level of significance 0.001 (Hair *et al.*, 2010) (Table VI).

4. Discussion

This study confirms that the service quality of architects is represented by five factors labeled as design quality, project administration quality, communication quality, relationship quality and dependability quality in the context of India. This number confirms the literature that service quality for architects is multidimensional (e.g. Parasuraman *et al.*, 1988) and also mirrors the number of factors that have been identified in other studies in service quality for architects albeit with a different cohort of respondents (e.g. Baker and Lamb, 1994; Sunindijo *et al.*, 2014). Essentially, this study identified that design quality has a significant impact on performance of service quality for architects in India (Table VI). It can also be stated that this study confirms the Nordic (Grönroos, 1982) and SERVQUAL (Parasuraman *et al.*, 1988) model of service quality with identified factors. For example, design quality is mostly associated with technical (Grönroos, 1982), and tangible (Parasuraman *et al.*, 1988) aspects of service quality. Dependability quality is clearly linked to the reliability dimension in the initial SERVQUAL study. Relationship quality is an amalgamation of aspects like assurance, empathy and responsiveness. Likewise, communication quality is a blend of aspects like empathy and responsiveness. Notably, project administration quality did not seem to align clearly with any of the SERVQUAL or the Nordic model of service quality. Project administration quality is to be considered as an aspect with a substantial source of performance indicator for service quality of architects (Shieh and Wu, 2002).

The finding that 20 of the 22 items received a mean score over four confirms the literature that customers of architectural service expect a high level of service quality

Regression	Estimate	SE	CR	P
DQ1 ← Design quality	1.001	0.081	12.364	***
DQ2 ← Design quality	0.720	0.067	10.714	***
DQ3 ← Design quality	1.051	0.075	13.991	***
DQ4 ← Design quality	0.892	0.103	8.672	***
DQ5 ← Design Quality	0.862	0.074	11.672	***
DQ6 ← Design quality	0.743	0.062	11.962	***
PAQ1 ← Project administration quality	0.859	0.051	16.815	***
PAQ2 ← Project administration quality	0.656	0.047	13.848	***
PAQ3 ← Project administration quality	0.956	0.055	17.292	***
CQ1 ← Communication quality	0.678	0.070	9.623	***
CQ2 ← Communication quality	0.814	0.084	9.685	***
CQ3 ← Communication quality	0.929	0.086	10.753	***
CQ4 ← Communication quality	0.684	0.059	11.545	***
RQ1 ← Relationship quality	0.678	0.051	13.269	***
RQ2 ← Relationship quality	0.480	0.060	7.931	***
RQ3 ← Relationship quality	0.987	0.077	12.736	***
RQ4 ← Relationship quality	0.810	0.069	11.778	***
RQ5 ← Relationship quality	0.865	0.077	11.247	***
DEQ1 ← Dependability quality	0.721	0.083	8.704	***
DEQ2 ← Dependability quality	0.891	0.076	11.785	***
DEQ3 ← Dependability quality	0.890	0.069	12.830	***
DEQ4 ← Dependability quality	0.832	0.076	11.001	***

Note: ***Stands for level of significance 0.001

Table VI. Regression weights for Predictive assessment when choosing an architect (Table IV). Similarly to the literature (e.g. Douglas, 1994), being trustworthy and providing appropriate functionality in building design were ranked extremely high. Interestingly, the items that were rated the lowest were related to administering contracts meticulously and settling claims. As India is a developing country with relatively less stringent procedures, it is highly likely that respondents considered these aspects of service quality less important than actual design development. With the legislation of the Real Estate Regulation Act getting into force to protect home buyers and encourage genuine private players in India, these project administration services offered by the architects would be more attractive for business that wants meticulous facilitation of contracts, fast reporting of statutory approvals and comfortable settlement of claims (Prakash *et al.*, 2017). Claim settlement had the highest variance amongst the items as related manifestations are likely to be short lived in the minds of the clients, which corresponds with the literature on service quality (Kumaraswamy, 1997). Additionally, the results validate Parasuraman *et al.*'s (1988) original claim that reliability is one of the most critical elements of service quality regardless of the services being studied. Thus, our findings are in line with the intuitive thinking about the validated factors of service quality for architects (see e.g., Lim and Tkaczynski, 2017).

This study also supports the argument that service quality of architects varies based on personal characteristics like level of education, age, gender, experience in the construction industry, primary liking of clients, net worth of handled projects in last year, liking of projects and specializations of interest (see e.g. Johnston, 1995). This research has also provided considerable insights into the service quality of international architects as they place a higher value on expertise by specialization than on needs of customers (Gleason *et al.*, 2006). Ideally, such generalization of a social or psychological phenomenon requires situations to exactly match with those of the original study (Strauss and Corbin, 1990). Further, Forsythe (2015) asserts that proposing one version to be generic would be inappropriate. Nevertheless, the generalization of this study can be attempted with countries in intergovernmental organizations with similarity in culture like South Asian Association for Regional Cooperation (Hofstede, 1984) and/or economics (Jaeger and Adair, 2013).

5. Conclusion

5.1 Contribution

The idea to fulfill the gap between perception and expectation from an architect in India is a unique theoretical contribution of this study. Since researchers contend that performance dimensions of service quality for architects require augmentation to increase their relevance in their contexts (Carman, 1990), the project administration quality factor produced in this study is a key theoretical contribution. As design quality includes items like functionality of the building design, flexibility for future changes and solution orientation to design, their manifestation in the validated scale is also a key contribution. These items of design quality are beneficial to the clients for ensuring the long life of their built structure.

5.2 Practical implications

The scenario of architectural design pertaining to service quality in construction, real estate, and infrastructure projects is unique in India. The determinants of service quality established in this study for architects would be useful for international firms interested in opportunities relating to contracting, consulting and engineering in India due to the further exponential increase in investments in construction projects.

This is the first empirically validated instrument for measuring the service quality of architects or the architectural firms. This scale of service quality can allow measurement periodically for comparison over time. Depending upon criticality of items, priorities can be decided to address the weaker areas and leverage the stronger areas. This study can also facilitate an architect to explore possibilities of higher fees in case of referral business. Additionally, this study extends the scant extant literature on service quality of architects.

5.3 Limitations and directions for further research

This research is not without its limitations. First, as conducted in the Indian context, the generalizability of this study to other countries is limited. There is an opportunity for this research to be replicated in other international contexts to verify the findings. Second, whilst this study identified five valid service quality factors, the classified information relating to the formation of expectations was not collected. Therefore, the future research can focus on identifying how expectations of architects are formed. This can be identified with service attitude, customer satisfaction and patronage intension to predict potential behavior linkages. The third limitation of this research is that it has not tested hypotheses for no difference based on available demographic information. An opportunity for future research is to classify sampled data into different socio-demographic groups to exercise control on their service quality gaps. Fourth, this study has used snowball sampling which is a non-probability sampling technique. Future research may apply a more accurate and realistic probability sampling technique.

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