

Quality issues related to the design and construction stage of a project in the Indian construction industry

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Abstract

Purpose – Quality in the construction industry is an important issue yet ignored during the initial stages of the life cycle of a project, that is, the design and construction stage. The contribution of stakeholders, especially the architects is generally suspended though it has huge significance in terms of cost and time related to quality. This research endeavors to examine the issues related to the design and construction stages of the project from architects' purview, to understand the relative importance of these issues in the Indian construction industry.

Design/methodology/approach – The study of qualitative data conducted formed a basis for online quantitative data collection that was further analyzed with the help of cross-tabulation and multiple correspondence analysis methods.

Findings – The study concludes that the budget of a project is a corresponding factor related to quality concern for architects. The study also established that the quality issues corresponding to high budgets are closely related to the construction stage and are identified as preparation of checklist, and bidding process of hiring the contractor on the lowest bid.

Research limitations/implications – The study is limited to analyzing the perspective of architects; however, other stakeholders of the construction industry may represent a different opinion.

Practical implications – This research emphasizes the importance of the client's role, and need for integration and coordination among stakeholders in the construction industry for effective quality control and management.

Originality/value – The research presents an exhaustive literature review on quality issues and its importance with respect to cost implications, standard practices, sustainability and the life cycle of the project.

Keywords Stakeholder, Integration, Total quality management, Coordination

Paper type Research paper

Introduction

Total quality management (TQM) is defined as “... the integration of all functions and processes within an organization to achieve continuous improvement of the quality of goods and services for customer satisfaction” (Vincent and Joel, 1995). After a long affiliation with the manufacturing business, quality has only recently been applied to the construction industry (Anetoh *et al.*, 2013). TQM adoption in the construction sector is difficult, according



to Hoonakker *et al.* (2010), because of the temporary nature of projects, the lack of standardization, the multiple parties involved and the conservative attitude of the construction business. Researchers have approved of a significant influence (Jimoh *et al.*, 2019) of TQM on the performance of an organization. Asim *et al.* (2013) emphasized that the quality assurance is the most important indicator of an organization's inclination for quality. According to Chandra (2016), the traditional organizational structure lacks the ability to integrate functional teams below the top management, as well as the ability to enable effective communication, coordination and control. Also, the complexities of project management have multiplied as the number of stakeholders in building projects has expanded.

Historically the architect was a master builder and administered the project, but the stakeholder management is essential in the current scenario [because the stakeholders are defined by Freeman (1984) as those groups and individuals who can affect or are affected by the achievement of an organization's purpose, and were later established as, "those groups who are vital to the survival and success of the corporation" (Freeman and McVea, 2001)]. The functioning, aims, growth and survival of an organization can affect and are influenced by stakeholders (Chinyio and Olomolaiye, 2010). They may have a direct (owners and users of facilities, project managers, facilities managers, designers, shareholders, legal authorities, staff, subcontractors, suppliers, process and service providers) or indirect (rivals, banks, insurance firms, media, community leaders, neighbors, public, government, tourists, consumers and regional development organizations) relationship with the project (Smith and Love, 2004). Akadiri *et al.* (2012) stressed upon the timely participation of all stakeholders in decision-making as one of the principles in support of sustainability issues, as well as consideration of all sustainable construction principles at every stage of a project's development.

Construction projects of poor quality occur worldwide (Ali and Wen, 2011) leading to serious issues of quality.

Modern architecture is dynamic and versatile owing to the interweaving of virtual spaces and the inclusion of advanced information technology in projects (Rochevova and Barchugova, 2016), and hence the role of the architect has gained crucial importance. Therefore, this research aims to examine the importance of various issues related to quality during the life cycle of a building project from the architects' perspective.

Literature review

The nature of the construction industry is different from manufacturing although both aim at delivering the finished product to customer satisfaction. Oztas *et al.* (2007) argued that the length of time required to complete construction projects; the development of human relationships; and the difficulty in identifying quality standards, processing input and implementing continuous improvement principles complicate the direct transition of continuous improvement principles from manufacturing to construction. Thus, cost and time have an important role to play as these are decisive areas having a significant impact on the consistency of the final product. However, Willer *et al.* (2015) observed that many certified organizations' management methods appear to be at variance with the established and fundamental objectives of ISO (International Organization for Standardization). Aside from that, the rise for environmental concerns and the necessity for sustainable construction have promoted the demand for quality in construction projects. Therefore, a thorough investigation is essential to understand the impact of quality issues with respect to cost implications, standard practices and sustainability during the life cycle of the project.

Relationship of quality issues with cost and time

A quality management system must be maintained, evaluated, monitored and enhanced regularly. Construction projects necessitate higher quality at a lower cost and in a shorter

time frame making it difficult to achieve a balance between the quality-cost-time relationship. The contractors are under pressure to deliver the project for the best value of money. For a successful project, the three essential parameters of time, cost and quality must be considered together since they are the three points of a triangle, and ignoring one of these variables would have a corresponding impact on the other two (Hughes and Williams, 1991). TQM is said to be focused on continuous improvement, and measurement of quality cost is believed to be a tool for its implementation. To achieve these goals, quality must be related to cost (Abdelsalam and Gad, 2009). To effectively collect and report quality cost data, the level of knowledge of the site workers should be as relevant as that of the management. As a result, there is a strong demand for low-cost training to improve the awareness and skills of site workers. The need for a quality cost structure stems from the fact that cost of quality's consequences cannot be realized without reorganization (HassenAl-Tmeemy *et al.*, 2012).

Relationship of quality issues with ISO 9000

Pheng and Omar (1997) identified problems related to the maintenance of ISO 9000 as (1) noncommitment and support from top management as they may resist innovation and change, (2) nonavailability of resources, (3) lack of training and education about quality management systems, (4) lack of documentation, (5) poor performance of suppliers and subcontractors, (6) engineering and construction problems, (7) coordination and communication problems.

Further, Pheng and Yeo (1998) explained that implementing ISO 9000 quality control systems will eliminate errors or defects by implementing more prevention steps and supporting them with sufficient appraisal tools to ensure that no defects are delivered to the next step of work or the customer, lowering rectification costs. The engagement of top management is the most significant factor in the effective implementation of ISO 9000.

Relationship of quality issues with sustainability

Buildings utilize more than 30% of energy, consume 40% of resources, produce 40% of waste and 35% of dangerous greenhouse gases (Tathagat and Dod, 2015). The term "sustainability" can be understood in three ways: social, economic and environmental, all of which must be balanced (Klarin, 2018). The environmental goals include improving environmental quality, reducing residues, utilizing less building materials, reusing building materials, recycling wastewater and reducing emissions. Resource conservation, cost efficiency and design for human adaptation are the three objectives identified to form the framework for implementation of sustainable building design and construction based on previously recognized principles of sustainability, that is, social, environmental and economic (Akadiri *et al.*, 2012). Reduce, reuse, recycle, protect nature, eliminate pollutants, life cycle costing and quality are the guiding concepts (Kibert, 2016). Embodied energy has become more important as it can account for up to 30% of total life cycle energy consumption (Kamath *et al.*, 2019). However, the education of building operators and occupants is critical to the successful implementation of sustainable techniques in operation and maintenance services (Miller *et al.*, 2018).

Relationship of quality issues with the life cycle of the project

Abdelsalam and Gad (2009) state that a building's life cycle is divided into four stages: design, construction, post-occupancy or maintenance, and demolition. Further, Ashokkumar (2014) categorized different stages of the project as conceptual planning, feasibility research, design, procurement, construction, acceptance, operation and

maintenance. Design and construction (D&C) are two critical identified stages having a considerable impact on the quality of construction projects' outcomes. [Kamath et al. \(2019\)](#) also argue that the concept and design are the bases of any construction project, as the concept stage has the greatest influence in terms of financial consequences and performance, and the design approach has potential to minimize the building's overall environmental impact throughout its life cycle.

The tendency of the client to award the work to the contractor with the lowest bid is one of the causes of defects because of lower quality ([Karim et al., 2006](#)). [Michell et al. \(2007\)](#) reported that in South Africa, approximately 70% of clients chose the traditional approach as the most used procurement scheme. Only 21% of management-oriented programs are documented where client time, cost and quality goals are achieved, whereas the design and build are accounting for just 9%. The importance of project management systems for effective quality, cost and time management is yet to prove its significance in the construction industry. According to [Kwakye \(2013\)](#), the continued expansion of the design and build (integrated) method as an alternative procurement method to the traditional method is due to a new paradigm change from the fragmented method to the integrated system, as well as the belief that design and construction should be integrated. [Chandra \(2016\)](#) explains that the traditional form of organization is not suitable; firstly, because it lacks in means of integrating different departments below the top management, and secondly it lacks in the facilitation of effective communication, coordination and control.

The integration of D&C practices is essential to create a high-quality structure. [Michell et al. \(2007\)](#) also suggested three different drivers for effective project quality management, including project team integration, emphasis on customer needs and a continuous improvement mechanism. Integrative activities either complement or improve the probability of achieving the core elements of successful teamwork ([Baiden and Price, 2011](#)).

The three most important factors related to the coordination of the construction projects are the scheduling, quality assurance plan and all parties' participation in design ([Alaloul et al., 2016](#)). Decisions made during the design stage have a significant impact on its following stages for delivering a high-quality design. The design offices are currently suffering from lack of coordination across various documents and lack of effective frameworks to address such a complicated issue. Contradictions, mismatches, mistakes and inconsistencies in drawings are examples of design synchronization issues that lead to late adjustments later ([Zaneldin, 2016](#)).

Planning and supervision, experience, quality of products supplied, management and communication, formal controlling methods, specific roles and responsibilities, and a quality department for overall management are the most frequently preferred factors to control quality ([Wawak et al., 2020](#)). [Pheng and Yeo \(1998\)](#) modified the definition earlier given by Quinn for the quality costs insisting that it consists of three components: preventive costs (to minimize, remove and avoid defects), evaluation costs and failure costs (to detect errors and evaluate the quality of the work done). According to [Hasan et al. \(2016\)](#), the most effective strategies for controlling defects in construction projects are enhanced workmanship, recognized responsibility for stakeholders, group meetings, good quality building materials, modern construction methods, legible drawings, conformance with specifications and regular inspection on-site. [Khan \(2021\)](#) identified the most common causes of building defects as dampness/seepage, poor craftsmanship, lack of quality control, inappropriate service installation and lack of maintenance during the post-occupancy stage. According to [Olagunju et al. \(2013\)](#), building collapse is caused by bad design, construction flaws, poor material quality/method of construction, foundation failure, fire tragedy, natural phenomena and inadequate maintenance.

[Egemen and Mohamed \(2006\)](#) found that the expectations of clients are much more than quality and are focused on finishing the project on time within budget. Construction

projects consist of activities that involve uncertainty, inherent risks and constraints. Client–contractor collaboration within activities is required for satisfactory project outcomes that have different expectations and needs, and therefore, it is difficult to find complete matching (Lau and Rowlinson, 2009).

Mane and Patil (2015) state that the quality of workmanship in all construction activities is a quality control measure. Following this is the establishment of a quality control laboratory on-site, the maintenance of a construction series and formats, the assignment of duties and responsibilities, site review meetings, sampling and checking, definite quality control procedures, adhering to specified curing and de-shuttering schedules, and coordination. Checklists are considered a powerful tool when used in combination with a routine schedule for quality control. Poor planning is a roadblock in project teams' ability to deliver high-quality results.

Forcada *et al.* (2012) analyzed that the omission of an aspect of the job, bad finishing or appearance and unsuitable finishing, lead to the most common defects. Lack of quality control is related to defects that occur in buildings during the construction and post-occupancy phase. Fernandez *et al.* (2016) discussed the defects in two categories: apparent defects [occurring soon after the property is handed over as specified by Forcada *et al.* (2012)] and latent defects (during an indefinite period after the handover of the building), and generally require a high cost for repair. Watt (1999) suggests certain factors which are responsible for defects in buildings as the use of improper material, wrong decisions, number of subcontractors, lack of repair works. In certain countries, quality control programs are often combined with protection and environmental systems (Giacomello, 2014) because of which they might not retain their significance.

Research orientation and methodology

This study used a mixed-methodologies approach, which involves gathering, analyzing, and combining quantitative and qualitative research and methods to examine the research problem (Creswell, 2012). The research question explored were as follows: “What are the quality issues related to D&C stages?” “What is the perspective of architects toward the quality issues during the D&C stage?” and “What is the relationship between an architect’s profile and their perception?” Possible indicators of an architect’s profile and quality issues were investigated to address the research question. The research aimed to identify the quality issues related to the D&C stage of a building project and the response of architects toward these issues in order to identify the trend in the construction industry, as well as the areas for future concern that need to be focused on. Hence, the objectives of the study can be enlisted as follows: (1) identification of quality issues related to building projects, (2) analysis of identified quality issues with respect to D&C stages, and (3) investigation of the relationship between the architect’s profile and identified quality issues.

Literature review and telephonic interviews were conducted to identify and summarize D&C-related quality issues of construction projects with the help of purposive sampling using a structured open-ended questionnaire. Ten architects practicing in Delhi and National Capital Region, having 20+ years of experience in projects of different nature and budgets, agreed to participate.

The quality issues identified were project management schedules, priority for saving cost, late introduction of contractor and consultants, hiring of a contractor on lowest bid, wrong/hasty decisions, unrealistic expectations of the client, omission of an element/task, construction control administration checklist, lack of communication, and noncompliance of quality management plans. The four indicators of the architect’s profile are work experience, the nature of the projects undertaken, the budget of projects and the nature of jobs (practicing, academicians or working in both capacities).

The research was further investigated to explore the relationship between the profile and quality issues. The alternative hypotheses proposed for analysis were as follows:

- H1.* There is a significant relationship between the typology of buildings and quality issues.
- H2.* There is a significant relationship between the years of experience and quality issues.
- H3.* There is a significant relationship between the budget of projects and quality issues.
- H4.* There is a significant relationship between the profession and quality issues.

Data collection

An online questionnaire survey was conducted to analyze objective 2 and to investigate the proposed hypotheses for objective 3. In a nonprobability sampling method, voluntary response sampling was conducted by sharing the link to the online questionnaire survey with 200 architects in India, out of which a sample size of 124 volunteered to respond. The response rate was 62% which is acceptable (receiving 20–30%) (Akintoye, 2000) concerning the construction industry. The sampling method ensured that only those architects who had strong opinion on the issue would respond which ensured the reliability of the sample.

Instrument design

A closed-ended questionnaire was designed to obtain the architect's profile and their responses toward quality issues in the D&C stages that consisted of two parts. "Part A" aimed to document the profile of respondents through a set of closed-ended questions with a single choice. "Part B" comprised statements on quality issues with closed-ended options having a multiple choice for inquiring whether the issue is related to design, construction or both stages. In a measure of the internal consistency and reliability of the responses to the questionnaire, Cronbach's alpha (α) for ten parameters reporting architect's perception on quality issues was 0.67 which is a moderate and acceptable score, as alpha reaching 0.70 is considered as an adequate measure of reliability or internal consistency in science education despite its limitations (Taber, 2018).

Data analysis and results

A descriptive analysis of the data was performed to obtain frequencies and cross-tabulation of data from the responses. Additionally, the data were analyzed for its statistical significance by performing a chi-square test and later multiple correspondence analysis (MCA), using Statistical Package for Social Sciences SPSS v 23.0. The descriptive analysis for 'Part A' was conducted for the four indicators of an architect's profile as shown in Table 1.

The analysis of responses to the ten items on quality issues in three different categories is shown in Figure 1.

The majority quality issues reported in the design stage were unrealistic expectations of the client followed by the priority for saving the cost; in the construction stage were construction control administration checklist, hiring of the contractor on lowest bid, and noncompliance of quality management plans; and in both stages were wrong/hasty decisions and lack of communication. Figure 2 demonstrates a radar chart for three stages against ten variables of identified quality issues. This graphical representation of multivariate data helps in understanding the quality issues' proximity with different stages.

Further, a statistical investigation was undertaken to examine the significance of the relationship between the architect's profile and quality issues in the D&C stages.

Profile	Items	Frequency (<i>n</i>)	Percentage
Profession	Academician	11	9.5
	Practicing	75	64.7
	Both	30	25.9
Working experience (years)	0–10	66	56.9
	11–20	36	31.0
	21–30	8	6.9
	31–40	3	2.6
	Above 40	3	2.6
	30–50 L	10	8.6
Project size/budget	51L–1.5 Cr	7	6.0
	1.6–2.5 Cr	9	7.8
	2.6–5.0 Cr	10	8.6
	Above 5.0 Cr	73	62.9
	Not applicable (for academicians)	7	6.0
	Residential	44	37.9
Typology of building	Commercial	28	24.1
	Institutional	21	18.1
	Industrial	2	1.7
	Other	21	18.1

Table 1.
Profile of the
respondents

Note(s): L-lakh, Cr-crore

The hypotheses were tested for statistical significance by applying a chi-square test to confirm the association between two categorical variables if there exists a significant chi-square value (Khangar and Kamalja, 2017).

No significant relationship was found between the architect's perception toward quality issues and the typology of buildings $\chi^2(8, N = 115) = 9.02, p = 0.341$; experience $\chi^2(8, N = 115) = 13.86, p = 0.085$; and professional experience $\chi^2(4, N = 115) = 1.2, p = 0.878$.

However, a significant relationship exists between the budget of the project and perception toward quality issues $\chi^2(8, N = 115) = 32.04, p < 0.001$. The chi-square value is greater than the chi-square critical value, that is, 20.09 (Bajpai, 2020) suggesting that the alternate hypothesis H3 is accepted with 99% level of confidence.

The chi-square test results, therefore, conclude that there is a significant relationship between the budget of projects and quality issues of D&C stages, as perceived by the respondents (Figure 3). Hence hypothesis H3 is accepted, whereas hypotheses H1, H2 and H4 are rejected.

A supplementary cross-tabulation was conducted to further explore the relationship between the budget and the perception (Table 2). Results revealed that maximum responses were received for projects above 5 crores budget ($n = 718$), and most responses pointed toward quality issues in the construction stage of the project ($n = 538$).

An MCA model is used to explore and visualize the patterns of relationships among the technology foresight methods and the evaluation criteria in the quantitative phase of research (Husson and Josse, 2014). MCA was performed to examine the significance of the relationship between the budget and quality issues (Figure 4). In MCA, the proportion of inertia accounted for 78.6% in the first dimension, and 21.4% in the second dimension; hence, a two-dimension matrix was analyzed. The inertia can be interpreted as variance in statistics and a stronger model fit is represented by a higher inertia score. The singular value displays the relative contribution of each dimension to an explanation of the inertia, and the values can be interpreted as the association between the rows and columns of the contingency table (Khangar and Kamalja, 2017). The first and second dimensions presented respective singular values of 0.153 and 0.080, and inertia of 0.024 and 0.006.

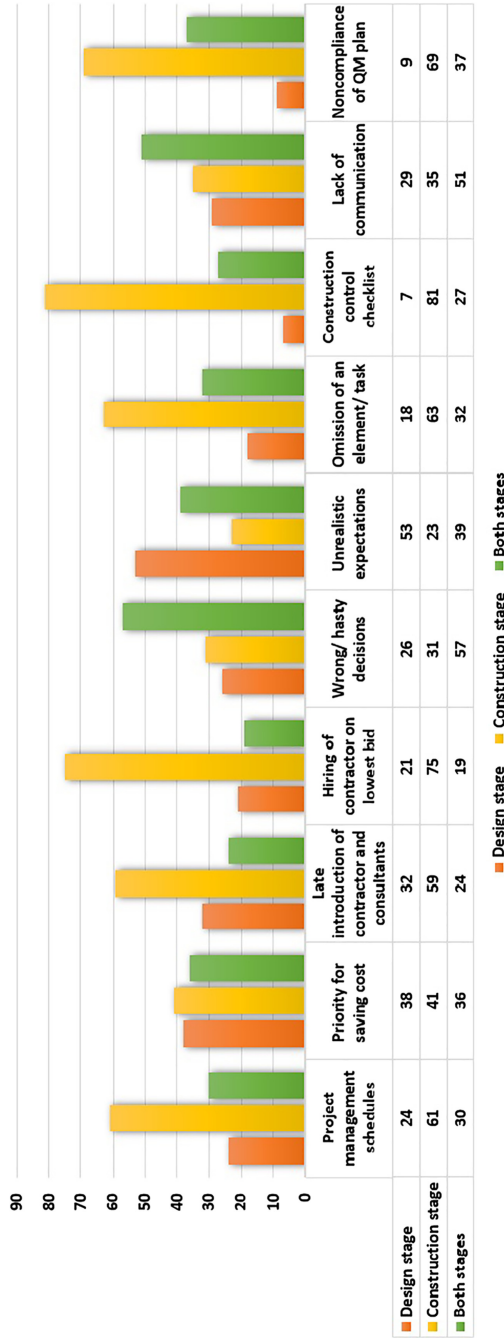


Figure 1. Quality issues in different stages

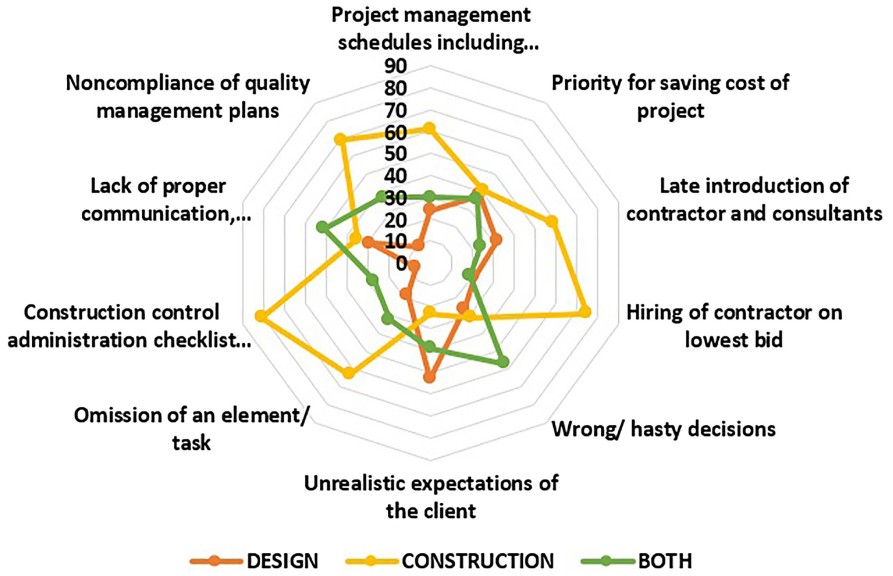


Figure 2. Radar chart for D&C stages

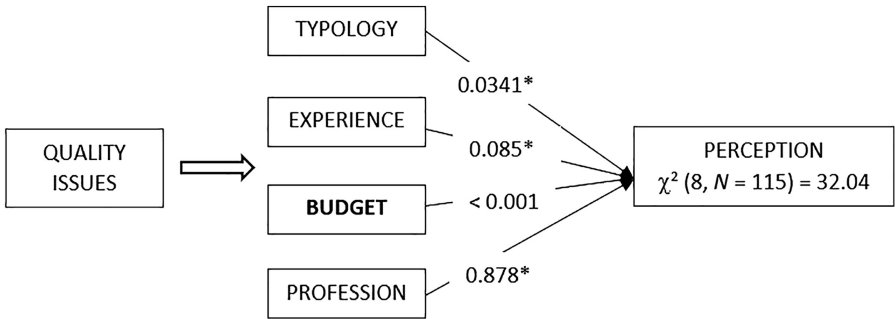


Figure 3. Hypothetical framework

Note(s): *Not significant

Project stages	Budget of the project					NA	Active margin
	30-50 L n	51 L -1.5 Cr n	1.6-2.5 Cr n	2.6-5.0 Cr n	Above 5.0 Cr n		
Design stage	30	13	24	11	159	20	257
Construction stage	46	42	41	37	345	27	538
Design and construction stage	24	15	25	51	214	23	352
Active margin	100	70	90	99	718	70	1147

Table 2. Cross-tabulation between project stages and budget

Note(s): L-lakh, Cr-crore, n-frequency, NA-not applicable

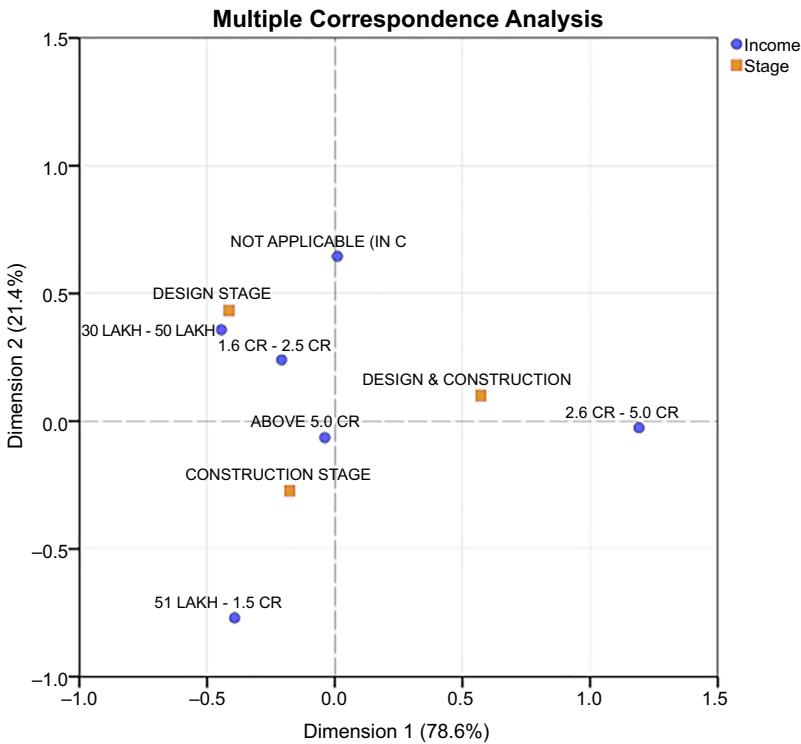


Figure 4.
MCA plot for budget
and project stages

MCA locates all the groups in the Euclidean space, where the first two dimensions are plotted to investigate the relationships between them. The combined graphical representation provides dual displays with identical row and column geometries, making it easier to identify different relationships (Ayele *et al.*, 2014). The MCA plot for symmetrical normalization of budget and project stages confirmed the significance of the relationship between the budget of above 5 crores and quality issues in the construction stage of the project, as shown by the proximity of both parameters in the plot (Figure 4). However, lower budget projects relate quality issues to design, but no significant relationship can be identified.

To investigate deeper, a cross-tabulation was conducted to explore the relationship between the budget of the projects and their responses toward ten items in the construction stage only. Most responses reported for quality issues in the construction stage were for the checklist prepared ($n = 57$), followed by the hiring of the contractor on lowest bid ($n = 49$). The lowest responses were received for unrealistic expectations of the client ($n = 12$), wrong/hasty decisions ($n = 17$) and lack of communication between the team members ($n = 19$).

Discussion

The qualitative analysis identified ten quality issues related to the D&C stages of the project life cycle, which were then assessed using a quantitative survey to determine how architects perceived the issues. The unrealistic expectations of the client (Egemen and Mohamed, 2006; Michell *et al.*, 2007; Lau and Rowlinson, 2009), cost-saving approach (Watt, 1999), late introduction of contractor and consultants (Michell *et al.*, 2007; Baiden and Price, 2011;

Kwakye, 2013; Mane and Patil, 2015; Chandra, 2016; Alaloul *et al.*, 2016; Zanelidin, 2016), lack of communication (Baiden and Price, 2011; Mane and Patil, 2015; Zanelidin, 2016; Hasan *et al.*, 2016; Wawak *et al.*, 2020), wrong/hasty decisions (Watt, 1999) and hiring of the contractor on the lowest bid (Karim *et al.*, 2006; Michell *et al.*, 2007) are highly related to the quality of the project during the design stage. Majority of architects perceived that the quality concern is mostly related to the construction stage of a project and is subjected to issues like controlling the administration of the project formally through a checklist (Zanelidin, 2016), hiring of the contractor on the lowest bid, noncompliance with quality management plans (Pheng and Yeo, 1998; Abdelsalam and Gad, 2009; Hassen Al-baidmy *et al.*, 2012; Mane and Patil, 2015; Alaloul *et al.*, 2016; Zanelidin, 2016; Hasan *et al.*, 2016; Wawak *et al.*, 2020; Khan, 2021), omission of tasks (Forcada *et al.*, 2012; Zanelidin, 2016), project management schedules (Mane and Patil, 2015; Alaloul *et al.*, 2016; Wawak *et al.*, 2020), and late introduction of the contractor and consultants. The responses for both stages prioritize wrong/hasty decisions and lack of communication as important quality issues. The results are in confirmation with Prajapati *et al.* (2015) that it is difficult to expect high-quality service if only the lowest tender is accepted, so a beneficial paradigm shift from “lowest price wins” to “multicriteria selection” for contractor selection is required. The results also emphasize the need to consider together the three parameters time, cost, and quality for a successful project as emphasized by Hughes and Williams (1991).

On further investigation regarding the relationship between the architect’s profile and quality issues during the D&C stage, it was observed that budget has a significant relationship with the quality issues. The majority of the quality issues are related to the construction stage, as the budget of the project increases. Besides this, quality issues related to design were reported as relatively less significant including issues such as communication between designer and team members implying that the role of communication is not significantly realized during all stages of the project significantly. Habibi *et al.* (2019) identified that lack of communication and slow decision-making processes are performance indicators, which are highly affected by managerial approaches. The responses for projects according to different budgets are 30–50 lakh ($n = 46$), 51 lakh–1.5 crore ($n = 42$), 1.6–2.5 crore ($n = 41$), 2.6–5.0 crore ($n = 37$) and above 5 crore ($n = 345$). The highest responses were received from respondents for projects of budget above 5 crores. It is observed that the four most important and vital quality concerns that had a lower response rate are under the client’s domain. It has been emphasized by researchers (Stojcetovic *et al.*, 2014) that top quality demands higher cost and time, but the practice of reducing the cost and time essential for the implementation of the project affects quality. Unfortunately, the observed quality issues are unrealized although many researchers have stressed upon the importance of the design process and early participation of construction experts in construction projects (Kania *et al.*, 2020).

Research implications and limitations

The endeavor of this research is to sensitize the stakeholder’s participation during different stages of the project’s life cycle, especially D&C. The Construction Industry Institute (CII) has promoted the concept of constructability focused on “the optimum use of construction knowledge and experience in planning, engineering, procurement and field operations to achieve overall project objectives” (CII, 1986). The objective of all construction projects is to accomplish the quality project within estimated time and budget, but the issues such as delay in the integration of team, wrong/hasty decisions, lack of communication related to D&C having a significant impact on the quality of the project are neglected. Besides this, the client’s unreasonable expectations and desire to save money affect the project’s quality. There is a need to emphasize upon quality issues during all stages of the project, and architects can play a key role by the integration of the team and laying emphasis on various quality issues since the inception of the design idea. According to studies, 70–85% of building maintenance and

running costs can be controlled during the design stage, that accounts for a significant amount of total building life cycle costs (Krstic and Marenjak, 2012), though it is practically possible only with the consent and awareness of the client; hence, the responsibility of the architect is proliferated, as the involvement of internal stakeholders is to be promoted. There is a dire need to focus on issues of integration of the team at an early stage of the project and coordination among the stakeholders because issues like hiring contractors at a later stage in the project and lack of communication are related to the late integration of the team. Regular review meetings and checklists are key drivers for controlling the quality. It is also noteworthy that the design decisions have an impact on quality, and the risk factors can be minimized with the integration of the team at the initial stage of the project. Thus the research proposes certain guidelines for stakeholders of the construction industry, such as, (1) comply with quality management plans, (2) practice early integration of the team and regular communication, (3) prepare project schedules, (4) hire contractor on expertise basis, (5) notify client about future cost implications due to unrealistic expectations, (6) avoid hasty decision-making without discussion and (7) organize regular review meetings for evaluation of prepared checklists. The research presents the architect's perspective regarding issues related to quality during the D&C stages of the project in the Indian construction industry, and emphasizes the need for integration and teamwork to effectively handle quality issues. However, the opinion of other stakeholders in the construction industry may differ from the results of this study and can be examined through similar studies in different contexts.

Conclusion

The research focused on ten quality issues related to D&C during the life cycle of the project. The first objective was achieved by identifying quality issues in the construction industry through interviews from experts and literature survey. The quality issues were identified as project management schedules, priority for saving cost, late introduction of contractor and consultants, hiring of the contractor on lowest bid, wrong/hasty decisions, unrealistic expectations of the client, omission of an element/task, construction control administration checklist, lack of communication and noncompliance of quality management plans. The second objective was fulfilled by analyzing the quality issues through a quantitative survey. The results highlight that high concerns of quality issues in the design stage of the project are unrealistic expectations of the client, priority for saving the cost, late introduction of the contractor and consultants, and lack of communication between team members. Major quality issues reported in the construction stage were not preparing and following the construction control administration checklist, hiring of the contractor on the lowest bid, and noncompliance of quality management plans. The common quality issues simultaneously reported in both stages by the respondents were wrong/hasty decisions and lack of proper communication between team members.

The third objective of the research focusing on the descriptive and inferential analysis confirms the significance of the relationship between the budget and quality issues in the construction stage of the project. This may suggest that the higher cost of the project enforces the inclusion of project management systems, and quality control issues are implemented with concern. On the contrary, the typology of the project, experience and the nature of the profession are not significantly related to quality issues. Cross-tabulation of the budget of projects and responses to quality issues within the construction stage provided further insights into key issues that need attention, and may help to positively address the quality concerns during project management. This study highlights the crucial role of the architect in controlling the quality issues, which have a substantial impact on the life cycle of a project. Successful implementation of management plans in consultation with team members during the initial stages of the project can address the growing concern for environmental issues and the need for sustainable construction.

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