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# A Statistical Method to Evaluate the Significant Factors That Causes Schedule Delays in Indian Construction Industry

**Gend Lal Chakrawarti, Ravindra Kumar Raj**

Department of Civil Engineering, Babu Lal Tarabai Institute of Research & Technology, Sagar, Madhya Pradesh, India

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**ABSTRACT**

Construction plays an important role in the socioeconomic development of any nation. For developing countries like India, time-bound, cost-effective, massive construction is the need of the hour. Delays in the timely completion of construction projects will cost the contractor, and business which ultimately impediments the growth of the nation. In the present work, we have studied and identified 21 universal causes of delay in construction projects based on delays extracted from other countries' findings research, as well as a published report (2021-22) from the Ministry of Statistics and Programme Implementation. The questionnaire (set of 21 causes of delay) has been prepared and floated to the various stakeholders, viz., project engineers, consultants, contractors, and clients associated with the Indian construction Industry. The uniqueness of this research work is that we have an emphasis on the opinion of the project engineers, as he is the link between contractors and consultants. This questionnaire has been classified into 7 categories, viz., client, contractor, Finance, Information flow, Labour & equipments, material, and planning & scheduling. The responses of the stakeholders have been collected on a Likert scale. Initially, responses, Reliability have been checked using Cronbach's alpha coefficient and Pearson's linear correlation coefficient. We found that causes of delays have stronger linear internal consistency and are strongly correlated with each other. Secondly, data validity has been checked using Kaiser–Meyer–Olkin (KMO) test. The high value of the KMO test reveals that gathered data are sufficient for factor analysis. Finally, once the data reliability and validity have been checked, the key factors influencing the construction schedules have been ranked using the relative importance index. We found that Shortage of materials; Lack of communication and coordination between the project stakeholders (client, contractor, architect, subcontractors, and consultant); Poor site management and supervision; unskilled workforce; Cash flow, and financial difficulties faced by contractors are the five most significant factors that cause a delay in timely construction of the project. These factors have been well-taken care at the planning and developing state of the project to complete the project at the stipulated time.

**Keywords:** Causes of Delay, Project Planning, Cronbach's alpha coefficient, Pearson's linear correlation coefficient, KMO Test

## I. INTRODUCTION

Construction is a vital sector that directly supports the economic development of emerging nations. It is a significant contributor to improving productivity and quality of life (Khanh H.D., 2014; Mahamid I., et al., 2013; Toor S.U.R., et al., 2008; Sambasivan M. S. Y., et al., 2007). This industry employs more than 49.5 million people, including indirect jobs, and it is labor-intensive. Despite the industry's contribution to the economy and creation of jobs, low efficiency, minimal mechanisation, and a shortage of workers with the necessary qualifications all hampered its expansion.

The project timeline is regarded as one of the most important performance metrics for managing construction projects, along with budgets and quality. (Durdyev et al., 2017; Patil V.M., et al., 2017; Mpofu B., et al., 2017; Durdyev S., et al., 2017; Doloi H., et al., 2012; Kazaz A., et al., 2012; Sun M., et al., 2009; Boukendour et al., 2009; Faridi A.S., et al., 2006; Koushki P.A., et al., 2005; Kumaraswamy et al., 1998; Alkass et al., 1996). Time delay is a chronic as well as a common problem in construction projects that results in increase in costing of the project, degrade in the quality of constructed projects, and high prone to project failure. Additionally, such a delay frequently has several negative effects, such as cash flow issues, mistrust, arbitration, and antagonistic relationships (Mpofu et al. 2017). Iyer et al., (2005) studied that over 40% of projects have reportedly been suffering from poor performance across India. In a different study, Ahsan et al. (2010) analysed the performance of foreign development projects in India, China, Bangladesh, and Thailand. They found that India's construction projects performed the poorest in terms of sticking to schedules among these developing nations. They found that India average schedule overrun (55% of the actual schedule) is the highest compared to the other developing nations. As per the status report published by the Ministry of Statistics and Programme Implementation (MOSPI) highlighted that in the last year itself India has witnessed 32.07% of projects running behind schedule projects, which results in a cost overrun of 19.53%. (as per the MOSPI report published 2021-22). Figure 1 shows the cost overrun and time delay in the last 7 years with respect to the originally approved cost and original schedule respectively [www.mospi.nic.in]. From the figure, it can be seen that there is a sharp increase in project delay for the period 2014-15, and the highest-ever project delay has been recorded (43.68%). Thereafter, there is a decreasing trend in project delay has been observed till 2018 (19.32%) which is a good sign for the healthy Indian economy. After 2018 the trend reversal takes place and the delay in the project again increases. The most probable factors that influence the project delay is that the world has been hit by the COVID-19 pandemic which is one of the significant factors that influence the project delay and cost overrun of the government-run project.

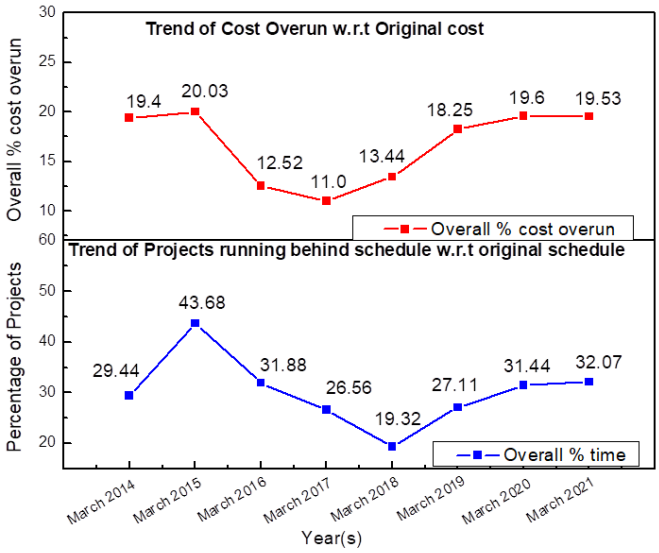



Figure 1: Trends of Cost overrun and Schedule delay for last seven years, As per MOSPI Report

MOSPI published report (2021-22), identified various causes of construction delay, viz., Issues with union ministries, Delays in acquiring ownership of the land,

delays in environment clearance, lack of infrastructure facilities, Lack of equipments supply,finance issues, delays in the finalization of detailed engineering Report, changes in order, delay in equipment supply, Law suits, environment clearance, contractual issues, encroachment, Inadequate manpower, state-wise lockdown due to covid-19, under-estimation of original coast, changes in foreign exchange rates, inflation, rehabilitation, spiraling land acquisition costs, changes in the scope of the project, vendors monopolistic pricing, are the major challenges faced by the construction industry. All these challenges cause a delay in the projects schedule.

With this advent increase in the Indian population, the demand for time-bound, cost-effective, qualitative massive construction is the need of the hour. The study related to schedule performance, especially in the Indian construction industry is certainly a significant topic for investigation. While many studies have been published on causes and factors affecting schedule, and cost performance, most of the studies are area-specific (Kim et al., 2008; Odeh et al., 2002). The applicability of such research in the context of the Indian construction industry still remains unexplored. There is a strong need to understand the attributes that cause time delays, and understanding the impact of these attributes on the construction industry is of prime importance. Thus, the primary objectives of this research are to identify the most significant factors that influence the delay, to identify the anomaly between them by using statistical concepts, and to predict the impact of these factors on construction delay using the regression model in the Indian construction industry.

## II. MATERIAL AND METHODS

In present work, a questionnaire survey approach has been adopted to determine the significant causes of project delay in the Indian construction Industry. The questionnaire survey has been framed based on a study of various causes of delay mentioned by international researchers, as well as reasons mentioned by the Ministry of Statistics and Programme Implementation. All the reasons were compiled, and modified; some were merged and eliminated to avoid ambiguity and brevity. The final list of 21 universally accepted questionnaires has been prepared. These questionnaires have been categorized into seven categories, viz., Client, Contractor, Information flow, Planning & Scheduling, Finance, Material, Labour & Equipment. These questionnaires have been shared via google form with the various stakeholders, such as professionals, and academicians associated with the Indian construction industry.

The 21 universally accepted factors that are the causes of delay have been listed in Table 1. The stakeholders were asked to give their judgment about the relevance of these factors on the project delay. A five-points Likert scale 1- not significant, 2 – slightly significant, 3 – moderately significant, 4– very significant, and 5 – extremely significant have been adopted where respondents were asked to rank the importance and impact of a particular attribute on delay in their selected site of projects.

**Table 1 :** A Catalogue of "Causes of project delay that have been classified into seven categories"

| Sr.No. | Categories | Factors Influencing the timeoverun |
|---|---|---|
| 1. | Client | Impractical terms and conditions imposed by clients |
| 2. | | Futile involvement of the client |
| 3. | Contractor | Excessive subcontracting |
| 4. | | Improper waste disposable strategy |
| 5. | | Rebuilding due to construction error |

| | | |
|---|---|---|
| 6. | | An issue related to quality |
| 7. | | Lack of top management commitment |
| 8. | | Poor site supervision |
| 9. | Finance | Delay in progressing the payment |
| 10. | | Cash flow and financial difficulties faced by contractors |
| 11. | Information flow | Slow information flow between parties involved in the project |
| 12. | | Lack of coordination between the project stakeholders |
| 13. | Labour & Equipments | Unskilled workforce |
| 14. | | Equipment breakdowns |
| 15. | | Lack of training for employees |
| 16. | Materials | Improper materials handling that causes damage |
| 17. | | Shortage of materials |
| 18. | Planning and Scheduling | Transportation delays |
| 19. | | Lack of a collaborative effort during planning |
| 20. | | Taking too much time in getting government permission |
| 21. | | Ineffective planning and scheduling |

Figure 2 shows the flow chart of the research work carried out in the present work. The first step, to identify the 21 causes of delays reported by other researchers and from the report of MOSPI. The second step, prepare a questionnaire survey by compiling, merging, and omitting the repeated causes of delay. This survey comprises two sections, first section is about gathering general information about the stakeholders, such as work experience, job profile, organization, etc. the second section is about gathering their opinion about the 21 floated causes of delay. Once the information has been collected the data analysis part takes place, and data validity and reliability have been checked. Thereafter, the five most significant causes of project delay have been derived based on the relative importance index. Lastly, the discussions and conclusions about these significant factors have been done in the present work.

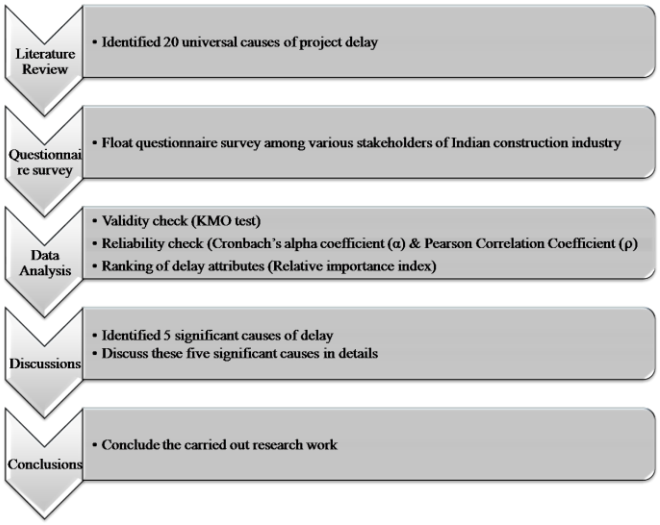



**Figure 2 Flow chart of the research carried out in Present work**

## Reliability

### 1) Internal Reliability

Reliability is defined as the degree to which a measurement process, such as an observation, questionnaire, or test, gives the same results repeatedly Wragg et al. (2000). The consistency of the replies can be measured using reliability analysis when the same measurement method is used repeatedly (Shang et al., 2012).Since, in this research the replied data were recorded on 5-point Likert scale, it is deemed necessary to test their reliability.

To test the internal reliability of the responses Cronbach's alpha coefficient (α), one of the widely used reliability indicator was used. The expression for the Cronbach's alpha coefficient (α) is given as:

$$\alpha = \frac{m}{m-1}\left(1 - \frac{\sum s_i^2}{s_y^2}\right)$$

Where, m is the number of items, $s_y^2$ variance of the total coloumn; $\sum s_i^2$ is the sum of the variance of each items. The general rule of thumb is α > 0.9 gives excellent linear consistency. In this work, the estimated value of Cronbach's alpha coefficient (α) is 0.9454 that indicates a stronger linear internal consistency. This result indicates that a respondent who chose a specific Likert-scale score for one of the items related to the factors that influence the project time overun in the Indian industry is likely to choose a similar score for the other items (Jin et al. 2017).

### 2) External Reliability

External reliability is the degree to which a measure differs from one test to another. The Pearson's linear correlation coefficient (ρ) is used to determine whether there is a relationship between the chosen attributes (Field, et al., 2005). The Pearson's linear correlation coefficient is the most commonly used linear correlation coefficient. The expression for the Pearson's linear correlation coefficient, ρ, is given as:

$$\rho = \frac{\sum_{i=1}^{n}\left(X_i - \overline{X}\right)\cdot\left(Y_i - \overline{Y}\right)}{\left\{\sum_{i=1}^{n}\left(X_i - \overline{X}\right)^2 \sum_{i=1}^{n}\left(Y_i - \overline{Y}\right)^2\right\}^{1/2}}$$

where

ρ: Pearson's linear correlation coefficient (variation between -1 to 1)

$X_i$ and $Y_i$ are column of variables of item1 and item2 respectively

$\overline{X}$ and $\overline{Y}$ are the mean of variables of item1 and item2 respectively

n is the length of each coloumn

In present work, the p-value of Pearson's linear correlation coefficient (ρ) is less than 0.01 for all the factors that influence the project time overrun. The indicates the causes of delay under study have the no significant correlations at the .01 level, so it can be concluded that the 21 delay factors are persistent and are valid to ensure external reliability.

## Validity

### 3) Construct Validity:

Construct validity is useful to assess whether a survey instrument actually measures the desired outcomes (Bagozzi R.P., et al., 1991). Construct validity was tested to see if a single factor should be extracted for each test or not (Black S.A., et al., 1996.). To test construct validity Kaiser–Meyer–Olkin (KMO) test was performed. The data is better suited to factor analysis when the proportion and KMO values are larger. A statistical test is used to determine whether the data are appropriate for factor analysis. The test evaluates whether sampling is adequate for both the entire model and individual variable.

$$KMO = \frac{\sum\sum_{j\neq k} r_{jk}^2}{\sum\sum_{j\neq k} r_{jk}^2 + \sum\sum_{j\neq k} p_{jk}^2}$$

where, $r_{jk}$ is the correlation between the variable in question and another, and $p_{jk}$ is the partial correlation. KMO coefficient for the 21 delay factors is greater than 0.7 (KMO = 0.87), which indicate sufficient for factor analysis. The KMO test demonstrates that the collected data are appropriate for ensuring construct validity and demonstrating the suitability of the variables for use in future factor analysis research.

### Ranking for the causes of delay

Ranking of any item is defined on the basis of Relative importance index (RII). It is a technique to determine the relative importance of each item. The RII was computed using the following equation:

$$RII(\%) = \frac{\sum_{i=1}^{n} w_i \cdot x_i}{W \times N} \times 100$$

where, i indicates the response category index, such as 1 – not significant, 2 – slightly significant, 3 – moderately significant, 4– very significant and 5 – extremely significant. Between 1 and 5, the numerator's $w_i$ denotes the numerical value allocated to the $i^{th}$ response, and $x_i$ displays the frequency of the $i^{th}$ response among all the responses given to i. W is the highest weight (in this case, 5), and N is the total number of responses, in the denominator.

## III. Results and Discussion

### Results of the Research Work

In the present work the survey has been conducted for 2 months (1/sept./2022-1/Nov./2022). The questionnaires were circulated via a google form, among the four categories of stakeholders associated with the Indian construction Industry. The google form contains two sections, first section is associated with general information about the stakeholders such as work experience, company association, job profile, etc. The second section contains 21 questions on the causes of project delay. The google form was floated to the 356 stakeholders. The majority of the stakeholders have work experience of more than 10 years in the Indian construction Industry. Among them, 273 have very well responded to the floated questionnaires. 83 respondents' answers were incomplete and inconsistent. Therefore, they have not been considered for data analysis and were eliminated in this study. Figure 2 shows the pie chart of the respondent. From the pie chart, we can reveal that 44.4% of the stakeholders were project engineers, 29.6% were contractors, and 22.2% were consultants/designers. The project engineers were the link between the contractor and consultants. Therefore, the opinion of the project engineer is important in this study.

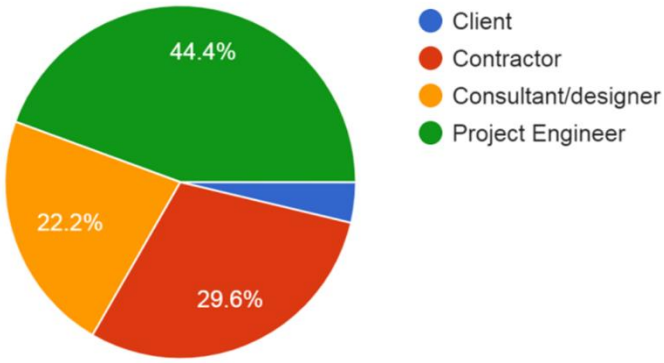
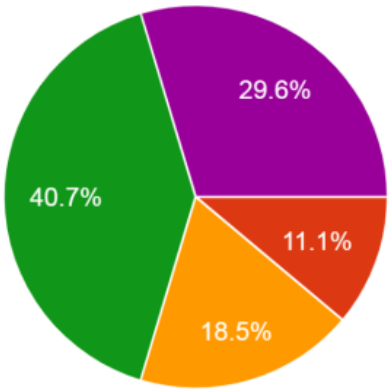


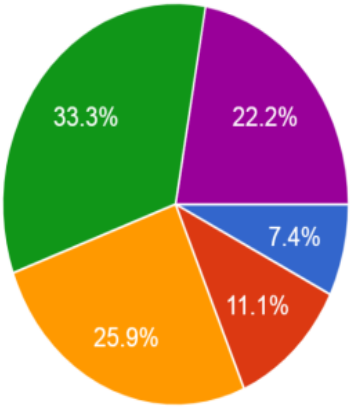

**Figure 3 :** Description of the respondent profiles

Figure 3 pie charts of the surveyed questionnaires and the opinion of stakeholders on Likert Scale. Table 2 shows the overall ranking of the causes of delay taken under consideration based on Relative Importance Index analysis. From figure 3 we can deduce that the pie chart of "shortage of materials" shows a 44.4% extremely important rating followed by a 37% very important rating. The 1st rank of the shortage of materials confirms the affirmation made by us. The 2nd rank was achieved by the Lack of coordination among the project stakeholders having 37% extremely important followed by a 40.7% very important rating. The 3rd rank was achieved by Poor site management and supervision having 29.6% extremely important followed by 55.6% very important rating. The last rating achieved by "excessive subcontracting" was 11.1% "not important" and 18.5% "slightly important" ratings. This is the worst rating received by any cause of delay. This attribute has got the least significant cause of project delay. Overall the top 10 most critical cause of delay as mentioned in the table were (1) shortage of materials (RII(%)= 82.96) (2) Lack of coordination

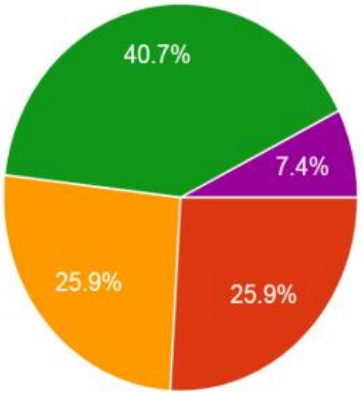
among the project stakeholders (RII(%)= 81.34) (3) Poor site supervision (RII(%)= 80.74) (4) unskilled workforce (RII(%)= 79.23) (5) smooth flow of Cash contractors financial cash crunch (RII(%)= 78.51) (6) Delay in progressing the payment (RII(%)= 77.77) (7) slow information flow between parties involved in the project (RII(%)= 76.29). (8) Lack of top management commitment (RII(%)= 75.94) (9) quality defect (RII(%)= 75.55) (10) ineffective planning and scheduling (RII(%)= 74.07). The analysis of the results is mostly based on the perception of the project engineer.



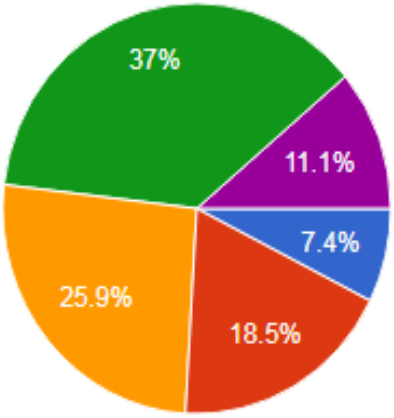

(a) Delay in progressing the payment



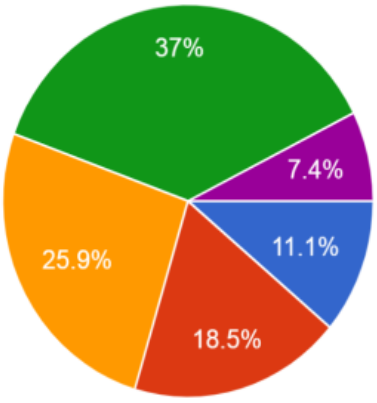

(b) lack of waste management strategy



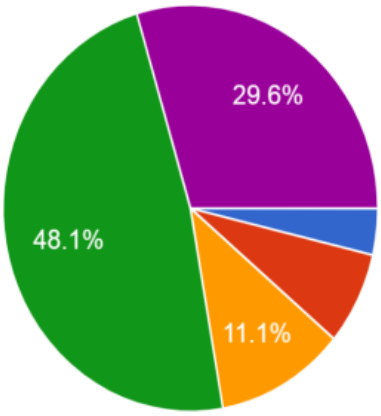

(c) Rebuilding due to the construction error



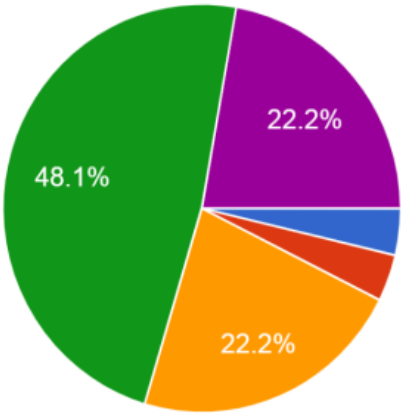

(d) unrealistic contract terms and conditions imposed by clients



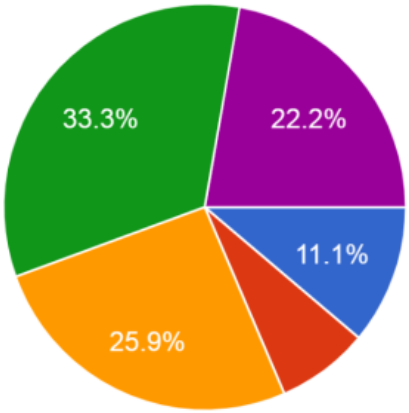

(e) Excessive subcontracting



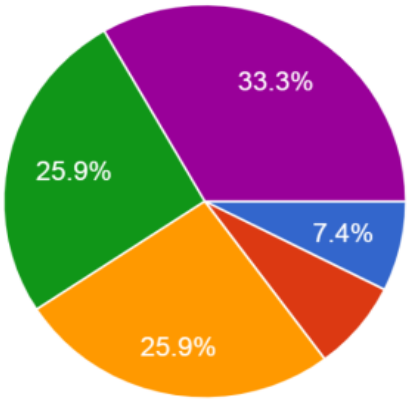

(f) Ineffective planning and scheduling



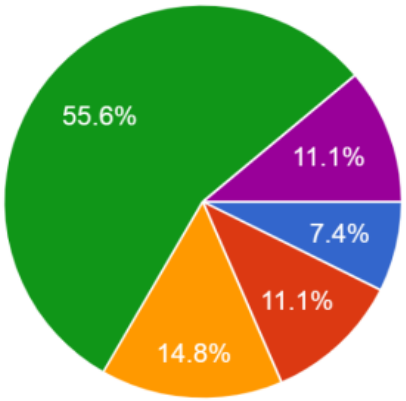

(g) Slow information flow between parties involved in the project



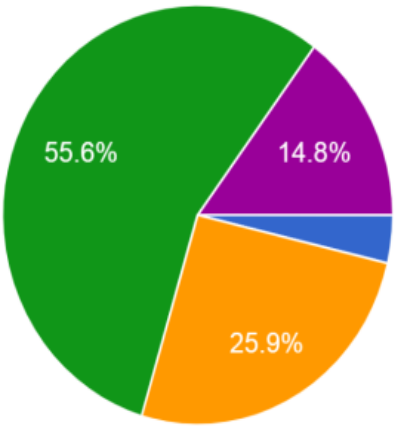

(h) lack of a collective planning



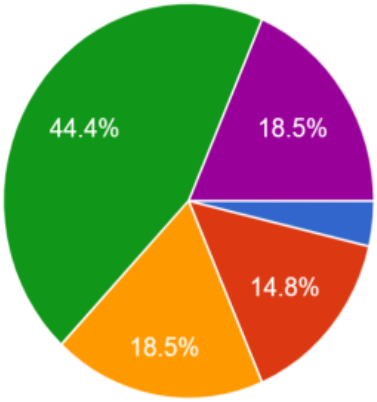

(i) unskilled workforce



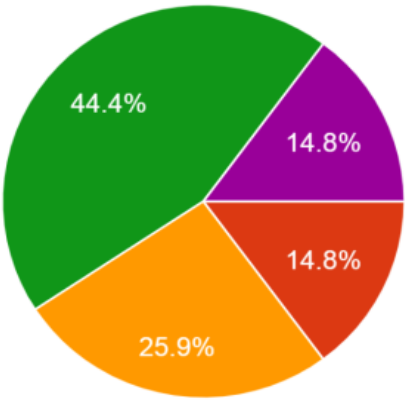

(j) Delay in obtaining permits from governmental agencies



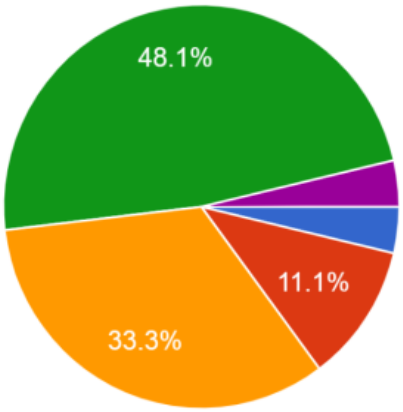

(k)quality issues



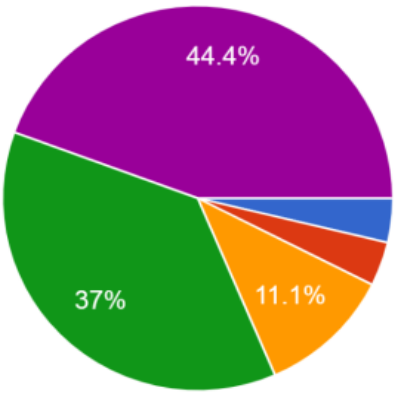

(l) Transportation Delay



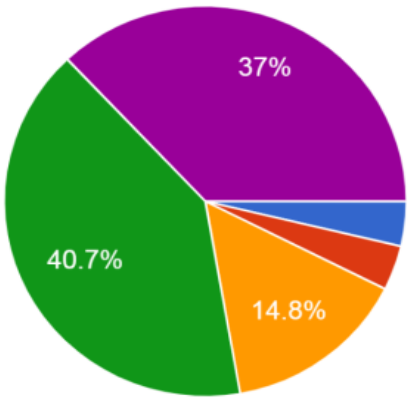

(m) Equipment breakdowns



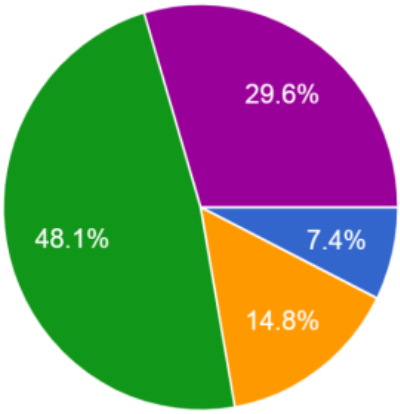

(n) Improper handling of materials damage



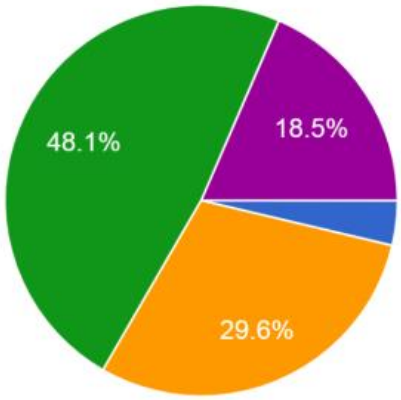

(o) Materials Shortage



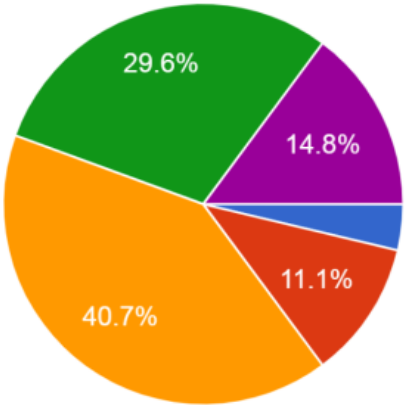

(p) Lack of coordination between the project stakeholders



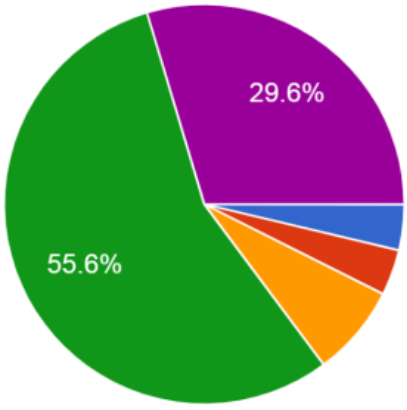

(q) Cash flow and financial difficulties faced by contractors



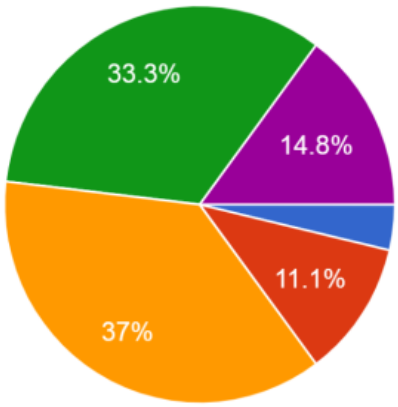

(r) Lack of top management commitment




(s) lack of training for employees




(t) Poor site management and supervision




(u)Futile interference of clients

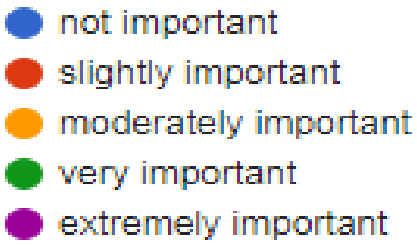



**Figure 4** (a-u) pie charts of the surveyed questionnaires and the opinion of stakeholders on Likert Scale

**Table 2** Causes of Delay with their Ranking based on Relative Importance Index

| Sl.No. | factors influence the time overrun | RII (%) | Rank |
|---|---|---|---|
| 1. | Materials Shortage | 82.96 | 1. |
| 2. | Lack of coordination among the project stakeholders | 81.34 | 2. |
| 3. | Poor site supervision | 80.74 | 3. |
| 4. | unskilled workforce | 79.23 | 4. |
| 5. | Poor Cash flow and cash crunch faced by contractors | 78.51 | 5. |
| 6. | Delay in progressing the payment | 77.77 | 6. |
| 7. | Poor information flow among the stakeholders | 76.29 | 7. |
| 8. | Lack of top management commitment | 75.94 | 8. |
| 9. | quality defect | 75.55 | 9. |
| 10. | ineffective planning and scheduling | 74.07 | 10. |
| 11. | Transportation delays | 72.41 | 11. |
| 12. | Equipment breakdowns | 71.85 | 12. |
| 13. | lack of waste management strategy | 70.89 | 13. |
| 14. | Delay in getting permission from government bodies | 70.37 | 14. |
| 15. | lack of a collaborative planning | 69.62 | 15. |
| 16. | Futile interference by client | 68.88 | 16. |
| 17. | lack of training for employees | 68.14 | 17. |
| 18. | Improper handling of materials causes damage in materials | 67.40 | 18. |
| 19. | Rework due to the construction error | 65.92 | 19. |
| 20. | Unrealistic terms and conditions imposed by clients | 65.18 | 20. |
| 21. | Excessive subcontracting | 62.22 | 21. |

Table 2 shows the top 10 causes of delay that have been categorized into 6 categories. The majority of the stakeholders believe that the client has the least interference in the project delay and the completion of the project is least hindered by the client. Maximum projects are delayed on the part of the contractor (3 causes of delay) followed by finance (2 causes of delay) and Information flow (2 causes of delay). The project engineers believe that Materials, Planning & Scheduling, and Labour & equipment impact on project delay was the least. As project engineers are the ones who have to deal with contractors, and management on the daily basis. They are in the right position to give the critical causes of delay. The majority of the projects can be completed on scheduled time with the help of efficient contractors, the right amount of cash flow, and the right and timely guidance to the contractors.

**Table 3** Top 10 Ranking of the Causes of Delay that have been classified into six Categories

| Sl.No. | Categories | Causes of Delay | Rank |
|---|---|---|---|
| 1. | Materials | Shortage of materials | 1. |
| 2. | Information Flow | Lack of coordination between the project stakeholders | 2. |
| 3. | Contractor | Poor site supervision | 3. |
| 4. | Labour & Equipments | unskilled workforce | 4. |
| 5. | Finance | Poor Cash flow and financial crunch faced by contractors | 5. |
| 6. | Finance | Delay in progressing the payment of completed work | 6. |
| 7. | Information Flow | poor information flow among the stakeholders | 7. |
| 8. | Contractor | Lack of top management commitment | 8. |
| 9. | Contractor | quality issues | 9. |
| 10. | Planning & scheduling | ineffective planning and scheduling | 10. |

Discussions about the top 10 causes of delay

Materials Shortage

Materials shortage is a critical impediment to the timely completion of the construction project. Materials price variation, transportation strikes, improper planning, and not timely intimation by labour to the manager, result in material shortage. This problem becomes more severe for project execution time working in the small scale construction projects, i.e., non formal business.

Lack of coordination among the stakeholders

Communication and coordination between stakeholders are regarded as critical success factors in any construction project. The major stake holders of the construction industry are owners, contractors, designer, architect, subcontractor, and consultants. Lack of coordination among the stakeholders is a major critical cause for the time overrun of more than 50% of the project. It arises from assigning work to the main contractor and its subcontractors to complete the planned tasks as per the master schedule, without considering other factors that may affect timely execution of project, viz., availability of materials and skilled work force as per the project requirement, safe environment conditions, financial support, timely payment for the work that is completed.

Poor site supervision

It has been observed that approximately, 40 % of the time wasted on site on futile construction work, i.e., non-productive work. It does not add value to the project cost. (Dupin 2014). The value-added time do not exceed 32%.Most of the time were wasted in waiting for all the stake holders to come to site on time, movement of the men, materials, and equipments (Bajjou et al. 2017b, 2017c). The causes of

this poor site supervision causes time overrun which ultimate results in profitability of the business.

Unskilled Workforce

An unskilled workforce is a major impediment to the timely completion of construction projects. Unskilled labour and poor workmanship can lead to the development of other issues such as issues pertaining to quality, rebuilding work due to construction errors, and low worker productivity, all of which have an impact on the overall performance of the project. If an unskilled workforce is unavoidable then training programs related to upskilled the worker must be conducted. Regular program to upgrade their knowledge by familiarizing them witht the latest technology must be carried out on timely basis.

Poor Cash flow and financial crunch faced by contractors

Construction projects necessitate timely funding, and if progress payments are delayed, the main project will suffer. To meet the daily construction expenses, the contractor and its subcontractors face several financial challenges. In most cases, contractors struggle to support their financial resources, resulting in project delays. This issue becomes more serious for companies that are not financially stable.

Delay in progressing the payment of completed work

Finance is the critical factors that causes time overrun of any construction site. Proper Flow of cash is required from the client to the contractors followed to the subcontractor, material suppliers, equipment suppliers, for maintenance work and overhead work such as office, house etc. The insufficient supply of cash to these stakeholders results in delay in construction projects. It has been studied that continous flow of cash in right amount results in time bound completion of project.

Poor information flow among the stakeholders

Majority of the project faces time overrun due to the lack of information flow among the stakeholders. The client sometimes changes the design of the project at the time of construction, or design may be changes due to the construction error, which ultimate results in demolishing the current structures and rebuild it again. The unclear thought among the clients, contractors, and the worker results in rework of the constructed project. The fast and wise judgment at the construction site results in time bound completion of the project.

Lack of top management commitment

Commitment from the management is the prime requirement for the timely completion of the project. Sometimes the site are vulnerable to accident due to lack of safety gadgets provided by the management. Accidents in site not only harm the individual it also harm the timely completion of project because time is wasting in attending the individual to the hospital. Sometimes contractors are also not motivated in timely completion of project, because they are running multiple site at one time. They have limited amount of skilled manpower which they distributes to the multiple site results in time overrun of the project at one site. Last factors that results in time overrun is that use of old and primitive techniques at the construction site.

Quality issues

The inexperience of the contractors, or some hidden interest of the contractors to save money motivate him to compromise with the quality of the materials being used at the construction site. Sometimes suppliers did not supply the right quality of material at the site, which if return to the vendors will results in delay in time of the project. The contractors in rush of money did not give much time for the materials to settle properly which ultimate results in defect in quality and if it is rework, results in time overrun of the constructed project.

Ineffective planning and scheduling

Extreme environment condition is the major factors that is mostly ignored at the planning stage. Indian subcontinent condition is such that it faces extreme

cold and hot condition in a particular year. These extreme conditions hampered the labour productivity and thereby if not considered at planning stage will result in time overrun. Festive seasons in India is another important factors that need to be considered at planning stage, as we know India is the land of festivals, unavailability of labour at festive season results in time overrun of the project.

## IV. CONCLUSION

The purpose of this study was to assess the critical causes of delays in the Indian construction industry. The questionnaires (set of 21 questions) has been prepared based on delays extracted from other countries' findings research, as well as the published report from the Ministry of Statistics and Programme Implementation. These questions have been classified into 7 categories. The survey has been floated to the various stakeholders associated with the construction Industry and their responses have been collected on a Likert scale. Initially, responses Reliability has been checked using Cronbach's alpha coefficient and Pearson's linear correlation coefficient. We found that causes of delays have stronger linear internal consistency and are strongly correlated with each other. Secondly, data validity has been checked using Kaiser–Meyer–Olkin (KMO) test. The high value of the KMO test reveals that gathered data are sufficient for factor analysis. Finally, once the data reliability and validity have been checked, the key factor influencing the construction schedules have been ranked using the relative importance index. We found that Shortage of materials; Lack of coordination between the project stakeholders; Poor site supervision; unskilled workforce; Cash flow, and financial crunch faced by contractors are the five most significant factors that cause a delay in timely construction of the project. These factors have been well-taken care at the planning and developing state of the project to complete the project at the stipulated time.

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