

Perceptions of Skilled Labour Attributes on Delays in Construction Projects in India

Dillip Kumar Das

Department of Civil Engineering,
Central University of Technology, Free state, South Africa
Email: ddas@cut.ac.za

Abstract

Evidence from the literature suggests that the causes of delays in construction are well researched. Client, contractor, consultant, design, equipment and material related aspects have varied influence on the occurrence of delay. However, the perception of various labour attributes on the occurrence of delay have been least investigated. Thus, the objective of the paper is to identify the various labour attributes that cause delay and examine how these attributes influence the occurrence of delay. A survey was conducted among various stakeholders that include engineers, contractors, clients, project managers, architects, supervisors, labour contractors and skilled labourers to collect the data on the perception of labour attributes that cause delay. To conduct the survey a questionnaire was distributed among 75 individual stakeholders selected through random sampling process from 3 construction projects in Bhubaneswar city of India. A perception index was developed based on weighted average method to examine the relative influence of the labour attributes on delay followed by descriptive statistics analysis and significance tests to establish the interlinkage between labour attributes and their consequences that cause delay. Findings revealed that lack of appropriate skill, lack of adequate remuneration, poor commitment by the labours to the project work are the major labour attributes which engender delay in construction projects. It is also found that lack of skill and competency lead to poor quality of work and consequently rework and delay. Poor remuneration prompts poor commitment to the projects. Poor commitment slows down the speed of work, and regular availability to the project and consequently influence the level of output, thus contributing to the delay of the projects. The findings contribute to the discourse of delay in construction from the labour attribute point of view.

Keywords:

Construction projects; Commitment; Delay, Labour attribute; Remuneration; Skill

1 Introduction

Availability of skilled labour is among the most essential requirements for successful and timely completion of the construction projects. The actual construction work, quality of construction, handling and use of materials, plants and machinery, preparation of site for construction, efficiency of supply chain in the project site and the completion and delivery of the project to name a few are the major activities that are carried out by the skilled labour. In other words, they carry the actual burden of construction and quality of work. It is thus imperative that there is a need to comprehend the skilled labour attributes so that skilled labour should not become impediments to construction and cause delay of projects.

Delay is apparently a major cause of concern in many construction projects. The sources of delays are varied and multi-fold. The essential reasons of delays in construction projects which have been evidenced from the literature include the performance and involvement of stakeholders, resource availability, environmental conditions, contractual relations, and so on

(Alaghbari, Razali, Kadir and Ernawat 2007; Bon-Gang, Xianbo, Lene Lay 2015; Bon-Gang, Shimin, 2014; Bon Gang & Lay Peng, 2013; Kaming, Olomolaiye, Stumpf, 2000; Odeh and Battaineh, 2002). The important causes of delays which have been intensively investigated are contractor related factors, client related aspects, and consultant design linked attributes (Alwi, and Hampson, 2003; Aiyetan and Das, 2015; Bon-Gang, Xianbo, Lene Lay, 2015; Bon-Gang, Shimin, 2014; Bon Gang & Lay Peng, 2013; Das, 2015; Sweis, Sweis, Hammad, Abu, 2008). Furthermore, improper and inadequate material supply that impedes on the speed of construction of a project relative to on time delivery is also a factor that causes significant delay. Poor quality of the material, poor material handling on site, poorly scheduled delivery of material to site, inappropriateness/misuse of material, poor storage, etc., which are performed by the labour force both on and off the project site influence the other activities and stakeholders to keep the project on schedule (Alwi and Hampson, 2003). Lack of trades' skills, poor distribution of labour, inadequate number of supervisors / foremen, inexperienced inspectors, and shortage of manpower (skilled, semi-skilled, unskilled labour) are also the factors that adversely influence the delivery of projects on time (Alwi and Hampson 2003; Odeh and Battaineh 2002; Sambasivan and Soon 2007; Satyanarayana and Iyer 1996; Sweis *et al.*, 2008). More importantly, lack of skill and competency of human resources - particularly the labour in the construction project are the major factors that adversely affect project delivery time (Alwi and Hampson 2003; Odeh and Battaineh, 2002; Sambasivan and Soon, 2007; Satyanarayana and Iyer, 1996; Sweis *et al.*, 2008). So, the role of skilled labourers in the completion of projects has been highly significant although largely undermined. Besides, although a plethora of researches have been evidenced on various issues causing delay in construction of projects, investigations on the challenges of skilled labourers and their attributes with regards to delay are scarce.

Therefore, the objective of the paper is to identify the various labour attributes that cause delay and examine how these attributes influence the occurrence of delay. For this purpose, a survey research method was followed and a perception survey was conducted among various stakeholders that include engineers, contractors, clients, project managers, architects, supervisors, labour contractors and skilled labourers to collect the data on the perception of labour attributes that cause delay. Findings suggest that lack of appropriate skill, lack of adequate remuneration, poor commitment by the labours to the project work are the major labour attributes which engender delay in construction projects. It is also found that lack of skill and competency lead to poor quality of work and consequently rework and delay. Poor remuneration prompts poor commitment to the projects. Poor commitment slows down the speed of work, and regular availability to the project and consequently influence the level of output, thus contributing to the delay of the projects. The findings contribute to the discourse of delay in construction from the labour attribute point of view.

2 Research Methodology

2.1 Case study area and profile of projects

Three construction projects in Bhubaneswar city of India were used as case studies for data collection from stakeholders. Bhubaneswar is the provincial capital of Odisha state located on the eastern part of the country. It is one of fastest growing cities of the country having a population of about 0.88 million and area of 422 sq. km (Census, India, 2011). Currently the city is being considered as one of the top most cities to be developed as a smart city in India. Although started as the administrative capital of the Odisha state (province), large scale

industrial activities particularly in the areas of knowledge industry and education sector become integral part of the city functions. Consequently, a spurt in the real estate development and construction activities have been seen particularly in the last one and half decade. Like many other parts of the country, construction activities in the city are also being suffered because of various challenges such as availability of finance, budget constraints, conflict among the stakeholders like promoters, contractors and consumers (buyers) and more importantly labour related issues. Therefore, to comprehend the labour related challenges and labour attributes linked to delay in construction three different projects have been chosen as case studies for data collection from various stakeholders engaged in the construction of the projects. The three projects include two building projects – a housing apartment project, one university building project in the private sector and a road project commissioned by the Government but executed by a private contractor. Table 1 presents the profile of projects. The estimated duration of the projects varies between 18-30 months for building projects and 12 months for the road project. The approximate estimated cost of projects is 3.0 million USD for housing projects, 0.75 million for university building and 0.5 million USD for the road projects (estimated from the information obtained from the stakeholders in the absence of actual and reliable estimate, which could not be obtained directly from the promoters/owners). The building projects were owned by private promoters/ developers and the contractors were appointed by the owners directly. The owners have direct authority over the contractors. The road project was owned by the Government (Municipal Corporation) and the contractor was appointed through competitive biddings. However, the labourers were the direct responsibility of the appointed contractors, who have appointed skilled labourers directly and employed semiskilled/unskilled labours through labour contractors/subcontractors

Table 1 Profile of projects

No	Type	Ownership	Estimated project cost (USD)	Estimated project duration (months)	Contractor
1	Housing projects	Private sector (Real estate developer)	3.0 Million	30	Multiple contractors from private sector engaged in different activities under the promoters direct authority
2	University Building	Self-financed University authorities	0.75 Million	18	A main contractor working directly under the promoters direct authority but has employed several sub- contractors
3	Road	Government	0.50 Million	12	Contractor selected through tendering process.

Source: Researcher

2.2 Survey, data and analysis

A stakeholder's perception survey was conducted to collect primary data by using pretested questionnaires. To conduct the survey a questionnaire was distributed among 75 individual stakeholders selected through random sampling process from the 3 mentioned construction

projects. The survey was conducted among various stakeholders that include engineers (12%), contractors (8%), clients (4%), consultant (8%) project managers (4%), architects (5.3%), supervisors (12%), labour contractors (8%), and skilled labourers (38.7%) to collect the data on the perception of labour attributes that cause delay (Table 2).

Quantitative descriptive statistics analysis and Cronbach’s alpha test of the data collected were conducted to observe the reliability of the data. A perception index was developed based on weighted average method to examine the relative influence of the labour attributes on delay followed by descriptive statistics analysis and significance tests (t test for $\alpha \leq 0.05$) at 95% confidence level were conducted to establish the interlinkage between labour attributes and their consequences that cause delay. Perception index was calculated by considering the weighted average of the perceptions of stakeholders assigned by the respondents on a particular variable in a scale ranging between 0 and 1. The formula used for calculating perception index is given in Equation (Eq.1).

$$\text{Perception Delay index} = \text{PDI} = \frac{\sum w x_i}{\sum x_i} \dots\dots\dots \text{Eq. (1)}$$

x_i = number of respondents assigning a particular index value

w_i = index values assigned by respondents.

A perception index was developed based on weighted average method to examine the relative influence of the labour attributes on delay followed by descriptive statistics analysis and significance tests to establish the interlinkage between labour attributes and their consequences that cause delay.

Table 2: Profile of respondents in survey

Stakeholders	Number surveyed	Response (%)
Engineer	9	12.0
Architect	4	5.3
contractor	6	8.0
Client	3	4.0
Consultant	6	8.0
Project manager	3	4.0
Supervisor	9	12.0
Labour contractors	6	8.0
skilled labourer	29	38.7
Total (N)	75	100.0

Source: Researcher

3 Findings and Discussions

The relative influences of the attributes were evaluated based on the share of respondent stakeholders agreed to a particular attribute as a challenge and the average perception index obtained from the responses assigned by them. However, before each attribute’s influence is measured the data and responses were checked for reliability and consistency of the responses. The high Chronbach α of the attributes (ranging between 0.81 and 0.89) suggest for reliability of the data set used for evaluation (see Table 3). Furthermore, the very low Standard Deviation (SD) values for each attribute (values range between 0.10 and 0.18) indicate the consistency of the responses (see Table 3). Therefore, the responses and data set was considered reliable and suitable for evaluation of the influences of skilled labour attributes on delay. Table 3 presents the relative influence of the various skilled labour attributes on construction delay. It is found

that majority of the respondents agree that lack of appropriate skill and competency among labourers (89.0%), inadequate remuneration (94.4%), poor commitment to the project (83.1%), lack of belongingness (81.3%) and lack of availability of labourers to project (76.1%) are the major skilled labour attribute challenges. However, relatively less number of respondents opine that lack of appropriate technical knowledge (62.1%), lack of training (60.7%), poor communication skill of labourers (57.1%), coordination and communication between supervisors and labourers (63.1%), motivation to complete a task in time (58.3%), and conflict with other stakeholders (34.8%) are relatively lesser skilled labour attribute challenges. Consequently, based on the perception indices, inadequate remuneration (PDI= 0.84), lack of appropriate skill and competency (PDI=0.82), poor commitment (PDI=0.79), lack of belongingness to the project (PDI=0.76), lack of availability of skilled labourers to the project on account of poor remuneration and commitment (PDI= 0.72) are the major skilled labour attributes which contribute to the construction delay.

Table 3 Relative influence of skilled labour attributes on construction delay

Skilled labour attributes	N	Response (%)	PDI	SD	Chronbach α
Lack of appropriate skill and competency	73	89.0	0.82	0.16	0.87
Lack of appropriate technical knowledge	58	62.1	0.61	0.14	0.84
Inadequate Remuneration	72	94.4	0.84	0.18	0.86
Lack of training	56	60.7	0.62	0.14	0.83
Poor communication skill	63	57.1	0.52	0.14	0.85
Coordination and communication between supervisors and labourers	65	63.1	0.68	0.16	0.86
Poor commitment	59	83.1	0.79	0.17	0.89
Motivation for completion of the given task	48	58.3	0.68	0.11	0.81
Lack of belongingness to the project	64	81.3	0.76	0.18	0.82
Lack of availability due to poor remuneration and commitment	67	76.1	0.72	0.12	0.81
Rework because of lack of skill and competency	62	77.4	0.77	0.15	0.84
Conflict with other stakeholders	69	34.8	0.42	0.10	0.84

(Significance test p values < 0.05 for $\alpha < 0.05$)

Furthermore, an interlinkage among the various major labour attributes and their causal effects that influence delay were established by significance t tests and p values for 95% confidence level (for $\alpha < 0.05$). Table 4 presents the interlinkage between labour attributes and causal effects. The significance test results revealed that lack of skill and competency cause poor quality of work that lead to rework (p values < 0.05 for $\alpha < 0.05$), which contributes to the delay of the projects. Poor remuneration lead to poor commitment, lack of belongingness and lack of availability of skilled labourers to the project (p values < 0.05 for $\alpha < 0.05$), which essentially lead to delay form the skilled labourers point of view. Similarly, poor commitment leads to lack of speed in work and adherence to schedule which also cause delay in construction (p values < 0.05 for $\alpha < 0.05$). However, analyses with regards to motivation to complete a task in time by the labourers indicate that while inadequate remuneration do not motivate the labourers to complete a task in time (p values < 0.05 for $\alpha < 0.05$). However, lack of appropriate skill and competency do not have any real bearing for lack of motivation to complete a task in time (p

values > 0.05 for $\alpha < 0.05$). Thus, the causal effects of lack of skill and competency and poor quality of work and consequent rework; inadequate remuneration leading to poor commitment, lack of availability of skilled labourers, lack of belongingness and lack of motivation to complete as task in time; and poor commitment leading to lack of speed in work and adherence to schedule influence construction delay from the skilled labourer attributes point of view.

Table 4 Interlinkage between skilled labour attributes and their causal effects influencing delay (based on significance t- test results and p values)

Labour attribute	Causal effect for delay	df	T values	p*	p**	Significance
Lack of appropriate skill and competency	Poor quality of work and rework	122	4.23	0.000022	0.000045	Significant
Inadequate remuneration	Poor commitment	116	3.79	0.00012	0.00024	Significant
Inadequate remuneration	Lack of availability	126	2.84	0.0026	0.0052	Significant
Inadequate remuneration	Lack of belongingness	126	3.58	0.00024	0.00048	Significant
Poor commitment	Lack of speed in work and adherence to schedule	116	4.16	0.00003	0.00006	Significant
Lack of appropriate skill and competency	Lack of motivation to complete task in time	94	1.59	0.057	0.115	Insignificant
Inadequate remuneration	Lack of motivation to complete task in time	94	1.79	0.016	0.033	Significant

Source: Researcher

4 Conclusions

Delays are a major challenge in construction projects in India. Skilled labourers are an integral part of construction projects and influence the timely completion of construction work. However, the skilled labour attributes component of the construction projects and their influence on delay in construction projects have been largely undermined. Moreover, studies on this aspect, particularly in the Indian construction industry sector are found to be scarce. So using the case study of three construction projects in Bhubaneswar city in India, and conducting a survey among the various stakeholders including skilled labours in the three mentioned projects, the study identified the various labour attributes that cause delay and examined how these attributes influence the occurrence of delay. The study revealed that inadequate remuneration, lack of appropriate skill and competency, poor commitment by the labours to the project work, lack of belongingness of labourers to the project and lack of availability of skilled labourers due to poor remuneration are the major labour attributes which engender delay in construction projects. It is also found that lack of skill and competency lead to poor quality of work and consequently rework and delay. Poor remuneration also prompts poor commitment, lack of belongingness, lack of availability to the projects and lack of motivation to complete a task in time. Poor commitment slows down the speed of work, and do not allow the labourers to adhere to the schedule and consequently influence the level of output, thus contributing to the delay of the projects. However, it is also found that lack of appropriate skill

and competency does not lead to lack of motivation to complete a task in schedule conclusively. Thus, the study indicates that major labour attributes such as poor skill and competency, inadequate remuneration, poor commitment, lack of belongingness of the labourers to projects are the significant challenges and their causal effects which need to be taken care of in order to mitigate or reduce delay in construction from the skilled labourers' point of view.

The paper has certain limitations such as the investigation is conducted based on primary data and perception of the stakeholders because of unavailability of structured statistical data. However, availability and analysis of statically data would have provided further insight to the skilled labour related attributes and their influence on construction delay. However, in its current state the findings contribute to the discourse of delay in construction from the labour attribute point of view, which has not seen intensive research so far. Besides, the study is relevant to the owners of the projects, project team including project managers, and supervisors as it will provide them the requisite insights to comprehend the skilled labour attribute related challenges and their causal effects that lead to delay so that corrective measures can be taken to overcome the challenges and reduce delay.

5 References

- Alaghbari, W., Razali, M., Kadir, S., Ernawat, G. (2007). 'The significant factors causing delay of building construction projects in Malaysia, *EngConstr Arch Manage*, 14(2), pp. 192–206.
- Alwi, S. and Hampson, K., *Identifying the important causes of delays in building construction projects. In Proceedings The9th East Asia-Pacific Conference on Structural Engineering and Construction, Bali, Indonesia, 2003.*
- Aiyetan OA., Das, D. (2015). Using system dynamics modelling principles to resolve problems of rework in construction projects in Nigeria, *Journal of Construction Project Management and Innovation*, Vol. 5(2), 1266-1295.
- Bon Gang, Hwang. & Lay Peng, Leong. (2013). Comparison of schedule delay and causal factors between traditional and green construction projects, *Technological and Economic Development of Economy*, 19(2) pp. 310-330, DOI: 10.3846/20294913.2013.798596
- Bon-Gang, Hwang., Shimin, Yang. (2014). Rework and schedule performance: A profile of incidence, impact, causes and solutions, *Engineering, Construction and Architectural Management*, 21 (2), pp.190 – 205.<http://dx.doi.org/10.1108/ECAM-10-2012-0101>
- Bon-Gang, Hwang., Xianbo Zhao, Lene Lay Ghim, Tan. (2015). Green building projects: schedule performance, influential factors and solutions', *Engineering, Construction and Architectural Management*, 22 (3), pp. 327 – 346.
- Census, India (2011). Odisha State, India
- Das, D., Development of Mechanisms by Using Conceptual System Dynamics Models to Resolve Delay in Construction Projects, International Construction Specialty Conference 2015, June 7-10, Vancouver, Canada, 2015.
- Kaming, P., Olomolaiye, P., Holt, G., Harris, F. (1997). Factors influencing construction time and cost overruns on high-rise projects in Indonesia. *Construction Management Economics*, 15(1), 83–94.
- Odeh A. M., Battaineh H. T., 2002. Causes of construction delay: traditional contracts. *International Journal of Project Management*, 20(1), 67–73.
- Sambasivan, Murali., Soon, Yau Wen., Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management, Elsevier*, 25, 517–526, 2007.
- Satyanarayana, K.N., and Iyer, K.C., Evaluation of delays in Indian construction contracts. *Journal of the Institution of Engineers (India), Springer*, 77, 14–22, 1996

Sweis G., Sweis R., Hammad A. Abu, Shboul A., Delays in construction projects: The case of Jordan. *International Journal of Project Management, Elsevier*, 26, 665–674, 2008.