International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2995-3002 www.ijaem.net ISSN: 2395-5252

Remedial measures for delay causes in road infra structure projects in developing countries

Aarti Sanjay Kamble, Dr. A. W. Dhawale

[1]*PG Student, JSPM's Imperial College of Engineering and Research, Wagholi,Pune, Maharashtra, India.*
[2] *Professor, JSPM's Imperial College of Engineering and Research, Wagholi,Pune, Maharashtra, India.*

Submitted: 10-07-2021 Revised: 23-07-2021 Accepted: 26-07-2021

ABSTRACT
Nowadays, Delay is one of the biggest problems often experienced on infrastructure project sites. In India most of the projects are not completed within time. Completion time is very essential in project because "TIME IS MONEY" Any construction project success can be realized by achieving its objective within the planned time, budget and level of quality. The aim of this paper is to investigate the causes and effect of delay on infrastructure project and suggest some remedial measures.

The top five causes of construction delays are land acquisition, environmental impact of project, financial problem, change order by client, poor site management, supervision by contractor. Large infrastructure project are inherently risky due to long planning. Technology is often not standard. Highway construction suffers from delay and cost over runs due to the following causes which are - traffic problems, changes in design, poor planning, cost overruns, poor safety, and time delay.
Key Words: Sustainability, Time delay, Cost overrun, Decision making, Uncertainty analysis, Time management, Delay management, etc.

I. INTRODUCTION

The construction industry is one of the main sector that provide important ingredients frothed envelopment of economy. How ever many projects experience extensive delays and Exceed initial time and cost estimates. Construction delay is considered to be one of the most recurring problems in construction industry and his adverse effect on projects success in terms of time, cost, quality and safety.

Investment in road infrastructure and also in the social sectors. Infrastructure play saparamount role in the economic growth of the country Road infrastructure investments in India have been growing on the consistent basis each five year plan, the government sets an ambitious target which is higher than previous one While some projects are impacted due to external factors which are beyond the control of implementing agencies such as land acquisition, regulatory approvals ate Majority of projects are delay by factors which can be controlled at the project level through proper planning and project management Delays are an integral part of any construction project India being rapidly developing country needs an equally rapidly developing infrastructure also, Delay can lead to many Negative.

Infrastructure is a fundamental factor of the Global Competitiveness Index (GCI). This index assesses the ability of countries to provide high living standards to their citizens. An infrastructure with high-quality roads enables markets to trade goods and services in a secure and timely manner.

Increasing population of Pune is one of the main cause of delay in construction projects in Pune. The second cause is the acquisition of land in the populated areas and because of that the problems in the survey of area arises. Most of the infrastructure projects in the Pune City are delayed due to land acquisition and survey problems. Hence the aim of our project is to find out the root causes and effects of delays and suggest some remedial measures to overcome the problem of delay.

OBJECTIVES
Infrastructure projects are in some ways unique and different from real estate Projects Hence this study would state the causes of delays faced in Infrastructure Projects, and analyze them in detail.
The main objectives of this paper basically are:

1 To determine the different stages in the project life cycle and the salient causes of delays in each of the different stages.
2 To suggest the probable solutions to the identified causes of delays.
3 To give recommendations to overcome

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2995-3002 www.ijaem.net ISSN: 2395-5252

critical factors which causes delaying project.

II. LITERATURE REVIEW SUMMARY

After carrying out various literature survey it is found out that found that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors are among the top 10 most important causes of construction delay. The main causes of delay were related to the designer, user, changes, weather, site conditions, late deliveries, economic conditions, and increase in quantity. They concluded that the most common cause of delay identified by the contractors, the consultants, and the owners is "change order.**Msafiri Atibu Seboru (May 2015)** found that materials, equipment, and labor-related delays are major causes of contractors' performance delays in the United Kingdom. Ogunlana et al. (2015) studied the delays in building projects in Thailand as an example of developing economies. They concluded that the problems of the construction industry in developing economies could be nested in three layers: (1) problem of shortages or inadequacies in industry infrastructure, primarily supply of resources; (2) problems caused by clients and consultants; and (3) problems caused by incompetence of contractors. The results showed that the most important causes are financing and payment for completed works, poor contract management, changes in site conditions, shortage of material, and improper planning.

Problem statement

The focus of our project is to study the root causes of delay in road construction projects and also give some remedial measures to avoid the delay. Many road construction project suffer from delay Suspension means stoppage of work directed to the contractor from the client, while delay is the slowing down of work without stopping it entirely, Delays give rise to disruption of work and loss of productivity, late completion of project, increase time related cost, and third party claims which leads to termination of contract. It is important that general management keep track of project progress to reduce the possibility of delay occurrence or identify it at Curly stages. Many road construction projects have faced various problems and delay of time is one of the major problems. The delay in dispute settlement has manifold effects such as it will give detrimental to the relationship between owner and contractor. The contractor and the owner pay for the extra charge for the completion of the project due to delay in large construction projects. When the completion time of the construction project exceeds the agreed completion time, itis known as construction project delay. It is needed to conduct detailed investigation and identification of delay factor sand then selecting the right actions to counter theses delay factors within cost and maintaining quality. The faults and errors due to the contractor cause delays and waste of capital and time Our study focuses on various factors causing the delays.

- To identify various causes of the delay
- How unpredictable delays can cause delays resulting in delays of the total project
- The effects of the delays on the project
- Study the causes and effects of the delays at various projects and to find out the most important causes.

II. METHODOLOGY

Methodology adopted to achieve the objectives of research work following flow chart :-

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2995-3002 www.ijaem.net ISSN: 2395-5252

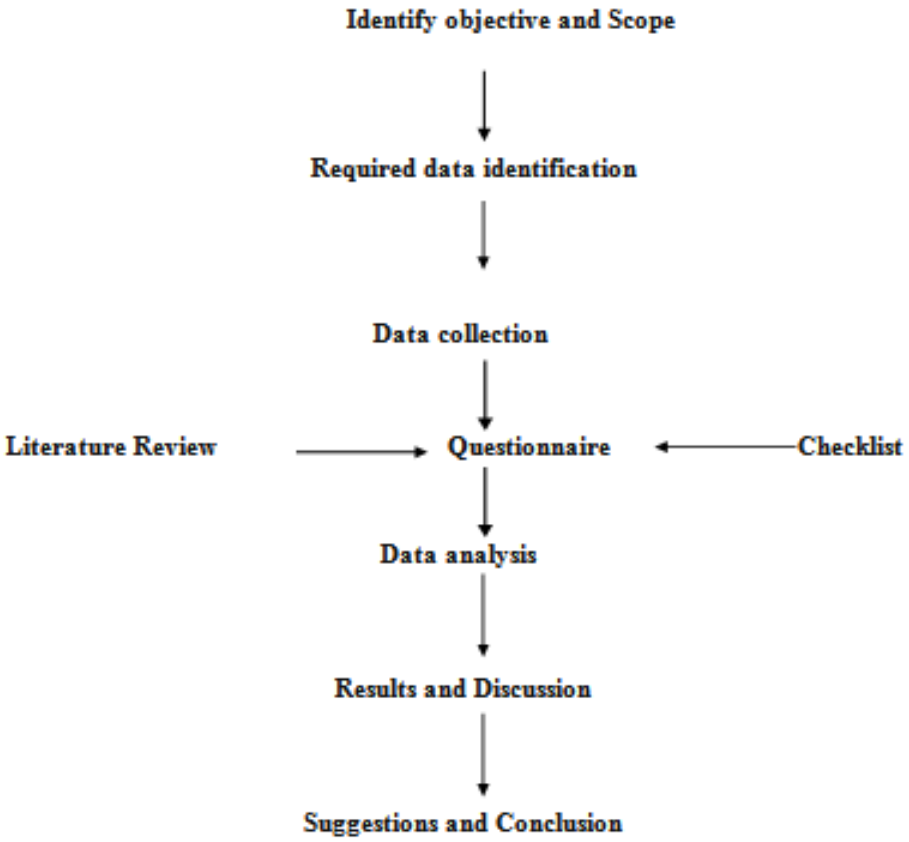

Fig. 1 Research Methodology Flow Chart

III. CASE STUDY :-

For present Research work In pune has been consider case study which are mention as below:-

Case study (1)

1. Client :- Pune Municipal Corporation
2. Project Management Consultant: - S.N. Bhobe & Associates Pvt.
3. Contractor :- JKumar Infraproject Ltd
4. Tender Cost :- Rs 24,99,39,211
5. Accepted Tender cost :- Rs 24,70,14,922

6. Time Limit:-24 months (Including mansoon)

To improve traffic condition in the city at various junctions to construct flyovers/ grade separator is one of measure in comprehensive mobility plan (CMP) 2008 prepared by Pune Municipal Corporation

Pune Municipal Corporation is one of city in India which is implementing BRTS for mass public transport. For implementing BRTS & Other infrastructural projects are suggested in CMP for improving mobility of the city.

PMC has established its own funds by loan/ grand under scheme of JNNURM Different works are proposed according to its need in CMP, Construction of flyover at Saswad Phata is one of the projects considered in 1" phase (on priority)

The proposed flyover is located on a crowded road in the heart of the suburbs of Pune.In addition to thickly populated area around the same, there is a big market place, BRTS Bus Terminal, schools, offices etc. The area is residential as well commercial place. This has resulted in highly increased Intensity of vehicular traffic and pedestrian traffic Specially, large traffic of Heavy vehicles like trucks, Buses ply on this road on account it is National Highway (Pune - Shölapur) and of timber market on the side. Pune Municipal Corporation has taken up a programmed to construct grade separated facility on priority

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2995-3002 www.ijaem.net ISSN: 2395-5252

Fig4. Google image of the Junction

4. 1.1 Silent Feature of the work:

- Length of flyover (Viaduct): -Pune to Saswad - 525 M

Saswad to Pune – 192M

- Length of Ramp: - Pune to Saswad - 87 M

Saswad to Pune - 107 M

- Estimated Cost put to Tender :- Rs 24, 99, 39,211/-

Revised Cost of Project :- Rs 26,52.97 441/-

- Period of Construction. 24 Months Up to 27/07/2013,
- First EOT Sanctioned : Upto 30/10/2015 (le 15 months
- Second ACT Sanctioned :- Upto 31/08/2015 (ie. 10 Months)
- Third EOT Sanctioned. Upto 19/01/2016 Cie. 4 Months)
- Final EOT Required: Upto 31/03/2016 (t.e. 2 months 11 Day

4.2.1 Detail analysis of delay :-

- Few shops at Saswad approach has to be removed, Encroachment wiN not removed. Prom the Date upto 20" may 2016 permission was still not granted for a span of 20m Shops could tved totally. Plinth wall was constructed on the back sute of approach way. Shops neat Bunter school compound has to be removed. There were total 142 shops. After shifting the was on the hack side of plinth wall then the road widening was done.
- There was total of about 33 trees that had to be removed from the path of the flyover. Hence for this sake permission was not granted by the High Court. This took another two years to grant pomie. So there was a delay of two years because of removal of trees.
- On the curve portion there was a previously situated police station. Hence objection was taken by the police station authorities on the curve portion since the flyover had to be constructed over the police station.
- The launching of girder on the curve took about one and a half years. Therefore there was a delay of one and a half years because of the objection of the police station and launching of girder From Pune to Solapur there was a water supply pipelines of 450mm, 500mm, 150mm The alignment foundation has to be changed. It was shifted to RIO which caused initial delay of sixmonth the piers Le from P9 to P13 there is construction of box girder. Therefore shuttering hasto be done.
- Be use of the curve there is a development of negative forces which could not be solved This caused a further delay. The launching of steal guider took a time period of one and a half year hence because of the launching of steel girder there was one year delay. Changes in design were frequent. From box-guider to l-girder
- As per the variation in the underlying strata pole foundation was not suitable everywhere at the initial stage pile foundation was considered to be adopted throughout but because of varying struta conditions this what not possible
- Heavy traffic affects efficiency of roads. Hence the traffic was divered through the

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2995-3002 www.ijaem.net ISSN: 2395-5252

BRTs from the alternative roads. For the widening of roads and smooth construction it was necessary to divert the traffic in that area

4.3 Case study 2

There are number of sites in Pune where the infrastructure project has been delay Hence for our project we have considered swargate flyover as our first case study.

- Name of site - Swargate flyover
- Location - Swargate to panchami
- Name of builder Pune Municipal Corporation PMC)
- Client – MSRDC
- Consultant - S. N. Bhobe and Associates
- Contractor - NCC Ltd.
- Start Date - 10 June 2013
- Stipulate Date - 9 Dec. 2015
- Project will require 30 months for completion.
- Total cost of project - 126 crore.
- Delay time - 6-8 months tentatively
- Type of survey - Traffic count, Topographic survey

The Pune Municipal Corporation has finally started construction work on the four Jane flyover from Swargate to Panchami. The new flyover when completed is expected to reduce congestion on the busy road of swargate junction.

The flyover that is being built at the swargate junction is divided into three pan (sarashaug, hadapsar, katraj). Now one lane from Swargate to Panchami has been completed. The construction of the remaining routes are in process. It will take at least nine months tentatively to complete the flyover. So the actual delay of this project is six months tentatively.

4.3.1Causes of delay of swargate flyover

1) Non-availability of land -Available width of road = 24 m

Actual width of road needed

2) Non-availability of funds -The flyover was supposed to be built upto big bazaar having a total cost of 160 crore. But because of no enough funds available with the PMO the flyover is being limited to Panchami only having cost of 126 crore.

3) Delay in permission from consulting agencies - The permission related to traffic is given by the Assistant Commissioner of Police because of that there was four month delay for the permission at the Laxmi Narayan junction.

4) Concreting work during night-Because of heavy, dense traffic and pedestrians at the junction concreting work could not be done during the day time. Hence all concreting work was during the night time. Working hours was reduced because of this and it caused delay of flyover.

5) Miscellaneous delay -The problems related to utility are often faced by contractor. Either they have to change the design or remove the utility (Ep Electric pole, water pipes, bus stand, hanners),

4.3.2 Effects of delays

- Penalty to be given by the contractor.
- Escalation to the contractor given by the owner
- Traffic congestion and inconvenience to the civilians.

fig no 5. Swargate to sasarbagh route

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 2995-3002 www.ijaem.net ISSN: 2395-5252

Fig no 6. Swargate to sasarbag

IV. SUGGESTION AND RECOMMENDATION

5.1. Consultant Related Recommendations:

- Consultants should ensure that all design changes during the execution of the works are handled explicitly while not compromising the desired outcome of the final project
- Any design errors made by consultants must be immediately rectified to avoid delays in the progress of works
- The consultants should ensure that adequate site investigations are carried out both during feasibility study and conceptual design so as to ensure that appropriate measures are taken care of during the detailed design so as to avoid suspension of works during the construction phase to address the design challenges

5.2. Contractor Related Recommendations

- Contractors should pay particular attention to the requirements of the antigament during the pre-contract and bidding period so as to go for works that they have competitive advantage
- Contractors should ensure that they have enough cash flow to execute the works and desist from the practice of diverting particular project funds to not project activities to avoid being cash-strapped during the execution of the works.

5.3 Client Related Recommendations:

- Clients must ensure that their demand in design changes during the construction periodshould have no adverse effects on the critical activities so as to avoid causing delays
- All change order demands must be evaluated to assess the ir impact on quality of work envisaged, scope and cost, possible claims and disruption to work so as to avoidunnecessary disputes and litigation.
- Clients should ensure that proper planning and costing of the works are made during the pre-contract
  period so as to avoid intermittent stoppage of works as a result of funding constraints since this not only increases the construction period but also impacts on the contractors overhead costs and costs

5.4 External Related Recommendations:

- All project stakeholders should work together and ensure that all disputes are mitigated during the construction period so as to avoid prolonging the planned executing timeduring the litigation process
- All stakeholders should ensure that proper planning must be done to cater for unforeseen events that may prolong the construction period, increase cost and cause danage to property and injury to project participants. Such risks should be transferred tocompetent stakeholders like insurance companies so as to help reduce the effect of costsin the event of delay

5.5 REMEDIAL MEASURES

After studying two project as a case study for delaying construction project following suggestion and remedial measures is given below

- Proper communication and coordination system between owner and contractor should he developed. Changes and alterations in planning execution should be discussed and pre informed so that it will not lead delay. Payments should be done on time so that project performance will not get affected
- Communication as well as document system should be developed so that drawings and their mistakes (if any) can be corrected as soon as possible. Implementation of practical knowledge also for junior consultant's proper

training course should be developed. The role of this training programmer should include leadership skill development, co ordination system improvement.

- Decision and steps taken during project life cycle should be beneficial for project performance. Use of MSP, Primavera or any other planning & scheduling software mist be compulsory. As the construction projects include huge number of participants, leam approach should be developed Contractor should employ different teams like technical team: finance team research team ete and cach team will have their specific goal or purpose. Technical staff should be assigned to project according to their area of expertise or capability This will be helpful to reduce the rework as well as overcome the problem of inadequate handling of project progress. Meeting between all teams should be arranged to build up effective management between project teams
- For the implementation of material management and quality assurance a dedicated team should be deployed. The role of this team should be material procurement. vendor selection, inspection. Thus it will be helpful in stores management as well as overcome the factor of untimely delivery. In project cost estimation this team will be helpful for alerting the factor of price escalation

V. CONCLUSION

- Overrun may occurs in most initiatives, the important that eliminated the use of a proper undertaking overall performance of all the key activities of every phase of the undertaking. The cycle is generally tremendous due to the fact making plans, measuring, tracking, and taking corrective movement are all generally blanketed in the control cycle. The mission proprietor and the venture manager have to be capable of clear outline the control achievement and product fulfillment so that the project crew has clear information of its targets.
- Top ranked are gathered and analyzed to propose list of recommendations to mitigate effect to delay in Indian construction industry. It is recommendation to change in planning and control in the used general contract in India to be coincide by defining time frame to submit original program and to force contractors to submit project. It is recommended to define prerequisite skills for project planner such as experience, working in similar projects, having adequate educational and technical skills to monitor project. It is highly recommend to enhance planning and controlling skills especially for owner side.
- This study aims to investigate the important causes of delay in transportation infrastructure projects. The literature is reviewed thoroughly and a questionnaire which contains sixty four possible causes of construction delays in transportation infrastructure projects is formed. The results revealed that the problem of construction delays in transportation infrastructure projects is frequent and notable. The top five important causes of construction delays in transportation infrastructure projects are mainly Land Acquisition, Environmental Impact of the project, financial closure, Change orders by the client, Poor site management and supervision by contractor.
- In summary; delays in construction projects are a widely researched area for which more researches are constantly being carried out. The analyses of the results were carried out based on the chosen methodology for this study. Data on the background of the respondents were considered in the initial stages of the analysis. This was followed by the presentation of the major factors of delay as identified in existing literature's which the researcher has examined thoroughly. The responses on the major factors causing delay were ranked in order of importance from the perspective of the consultants, contractors and subcontractors. Finally the effects of delays were also analyzed and the responses were ranked.

REFERENCES

[1]. AbdallaM.Odeh&HusseinT.Battaineh"Cause sofconstructiondelay:traditionalcontracts."In ternationaljournalProjectManagement20(200 2)67-73

[2]. Asish Ram, Dr. Pratheeba Paul(Mar-Apr. 2015) "Study on Construction Sequence Delay forRoad InfrastructureProjects".Volume 12,Issue 2Ver.W(Mar-Apr.2015),PP15-21

[3]. Aziz, R., & Abdel-hakam, A. (2016). Exploring delay causes of road construction projects in Egypt. Alexandria Engineering Journal, 55(2), 1515–1539.

[4]. Chan, J. R., & Lin, H. S. (2014). Preliminary study on application of building information modeling to underground pipeline management. In Application of

Nanotechnology in Pavements, Geological Disasters, and Foundation Settlement Control Technology (Vol. 1, pp. 69–76). Yichang, Hubei, China

[5]. Dr.RalphD.Ellis&Dr.H.RandolphThomas"TherootcausesofDelaysinhighwayconstruction",transportationresearchboard,Washington2003.

[6]. Elawi, G. S., Algahtany, M., Kashiwagi, D., & Sullivan, K. (2015). Major factors causing construction delays in Mecca. Journal for the Advancement of Performance Information and Value, 7(1), 1–11.

[7]. Ellis, R. D. (2003). The root causes of delays in highway construction. In Presentation at the 82nd Annual Meeting of the Transportation Research Board (pp. 1–16). Washington, USA

[8]. Ibrahim Maliamid(2013)" Common Risks Affecting Time Overrunin Road Construction Projectsin Palestine" 13(2) 45-53.

[9]. Mahamid, I. (2017a). Analysis of schedule deviations in road construction projects and the effects of project physical characteristics. Journal of Financial Management of Property and Construction, 22(2), 192–210.

[10]. MsafiriAtibuSeboru(May2015)"AnInvestigationintoFactorsCausingDelaysinRoadconstructionProjectsinKenya".Vol.3,No.3,2015,pp.51-63

[11]. Ms.Yogita llonrao, Prof DM Desai "Study of delay in execution of infrastructure projectshighway Construction", international journal of scientific and research publication, Volume 5.Issue 6dune2015.

[12]. Patil, S., Gupta, A., Desai, D., & Sajane, A. (2013). Causes of delay in Indian transportation infrastructure projects. International Journal of Research in Engineering and Technology, 2(11), 71–80

[13]. Rachid, Z., Toufik, B., & Mohammed, B. (2018). Causes of schedule delays in construction projects in Algeria. International Journal of Construction Management, 1–11

[14]. RemonFAziz,AsmaaA.AbdelHakam(March 2016)"AModelforEvaluationofDelaysinConstructionProjects"VoL5,Issue3,March2016)` AnalysisofcriticalofdelayinIndiannfrastructure projects".Vol2issue 3.

[15]. S.M. Vidal's & F.T. Nnjafi "Cost and time overruns in highway construction-. Transportation specialty conference of the Canadian society for civil engg.,Issue 8June 2002.

[16]. Sohu, S., Chandio, A. F., & Kelee mullah. (2019). Identification of causes and minimization of delays in highway projects of Pakistan. Mehran University Research Journal of Engineering & Technology, 38(1), 103–112

[17]. S.K.Patil,A.K.Gupta,D.B.Desai,andA.S.Sajane"CausesofdelayinIndiantransportationinfrastructureproject",Internationaljournalofresearchinengg.Andtechnology,Volume2,Issue11 Nov.2013

.