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Causal Sequencing Model for Claims in Indian Infrastructure Projects

Abhijit Vishnu Mohite[a], Dr. Girish Mahajan[b]

[a]Student of Department of Civil Engineering School of Engineering and Technology

Anjuman-I-Islam's Kalsekar Technical Campus New Panvel. Navi Mumbai- 410 206

[b]Guide of Department of Civil Engineering School of Engineering and Technology

Anjuman-I-Islam's Kalsekar Technical Campus New Panvel. Navi Mumbai- 410 206

Abstract

This paper introduces a Causal Sequencing Model for Claims in Indian Infrastructure Projects in an effort to investigate and manage construction disputes in large-scale building projects comprehensively. The study investigates a variety of alleged problems and their fundamental primary causes, as well as the compensatory measures typically associated with construction projects. Through an in-depth analysis of agreements and assertions cited in solicitation notices, this study reveals the significant impact of explicit and well-defined contractual terms on mitigating the risk of prospective claims. The study identifies existing gaps in the claim management procedure and proposes an effective strategy to superintend and enhance the oversight process, with a focus on early claim identification, robust documentation, and proactive dispute resolution techniques. In addition, the research sheds light on the intricate relationship between various project variables and their impact on claims, thereby furthering the understanding of contemporary studies in a novel context. By employing a mixed-method approach, including a literature review, case studies, and qualitative interviews with key stakeholders, the findings offer a comprehensive framework to enhance claim management practices and ensure the success of Indian infrastructure projects.

Keywords: Causal Sequencing, Model, Claims, Indian Infrastructure Projects.

I. Introduction

In the construction industry, disputes have been designated as epidemics, and they frequently result in the failure of projects, the loss of time as well as money, as well as the deterioration of relationships between project participants. Unresolved disputes have a tendency to escalate as well as inevitably lead to dispute-resolution proceedings. These procedures are costly and time-intensive. The 2018 Global Construction Disputes Report indicates that the average adjudication time for a construction dispute is seventeen months. Costs are increased both directly (fee for claims consultant, project delay, etc.) as well as indirectly (deterioration of working relationships, lack of collaboration, mistrust among stakeholders). The direct costs of construction disputes range between 0.5% and 5%. Occasionally exceed the project cost estimate. It is essential to investigate construction industry disputes and their origins, and appropriate management action can be taken if backed up with substantial evidence. Significant causes of disputes in the construction industry include delays in decision-making, delayed progress, cost overruns, a lack of stringent quality control, modifications, as well as the interpretation of contractual terms. Numerous studies have categorized as well as appraised the numerous conflict causes. To reduce the incidence of disputes, it is necessary to recognise the interrelationships between the most essential dispute-causing factors, in addition to identifying the factors themselves. These aspects have not been investigated in a systematic manner. The primary objective of this study in the present setting is to

- Develop a methodical hierarchy model to identify the fundamental influences among causal factors.
- Evaluate the propelling and reliant forces of each causal factor in connection with the others.

To accomplish this, a literature review was conducted to identify a number of construction phase-related causal factors, which were then confirmed through a pilot study.

1.1 Infrastructure project

A prospective infrastructure initiative focuses on the enhancement and maintenance of existing services, facilities, as well as systems throughout a country. Advances to communications equipment, transportation channels, as well as electrical systems are examples. Private and public companies fund initiatives that ensure the efficiency

as well as security of a nation's operations. This provides citizens with access to electricity, technologically advanced communication, as well as convenient modes of transportation.

1.2 Construction claim

A construction claim is the assertion of a right requiring additional time or monetary compensation from one party to the Contract (typically the Contractor) for losses sustained because of the other party's failure to fulfil contractual obligations. Frequently, construction claims are the result of clients, contractors, as well as subcontractors' efforts towards accomplishing their objectives and maximize their benefits.

Contractors are sometimes constrained to submit project proposals with low profit margins in order to remain competitive in the midst of intense market competition. As a result, contractors face increased pressure to complete projects whereas earning less compensation. Due to divergent expectations and objectives, there will be a high likelihood that the Contractor will fail to satisfy the client during the project's execution, resulting in conflicts. Numerous project participants have rated construction claims to be one of the most difficult and unpleasant phases. They may result in a protracted legal battle or, worse, insolvency.

1.3 Root Causes of Claims in Construction Projects

Numerous perspectives, including quantification, prevention, administration, and planning, have been utilized to examine assertions. Classifying claims and identifying the most prevalent causes of disputes, claims, and disagreements is a common practice in the current corpus of literature. A substantial quantity of research has been devoted to identifying the variables and catalysts associated with disputes. Despite the utility of identifying these variables, they are incapable of elucidating the fundamental causes of conflicts. In addition, the list in Appendix 1 discusses the various reasons and subcategories that Kumaraswamy discovered in the literature. Authors classify and identify the causes of claims in various ways. Nonetheless, there are a few parallels. Categorized claims (Change and Effect assertions) according to a literature review. In addition, the identified causes were classified using an instance analysis:

- Different surroundings
- The tardiness of the project's participants
- Alterations in plan and specifications
- Acts of God
- Inaccuracies or unclear agreements

While this classification might include the majority of different writers' classifications, several pieces on disagreements and disputes in the building business focus solely on the circumstances when defining the dispute and typically overlook the root causes, thus incorrectly identifying pertinent factors as causes. Employed a questionnaire survey and personal interviews to validate the field study's results. Concerning EPC, initiatives conceptualise reasons for building allegations using current research and experimentally assess the reasons for them with a sector questionnaire, modelling of structural equations, and case research from the Chinese vendors' viewpoint.

The detection of the true causes of disputes and claims employing fundamental analytical tools looks to be lacking in the research. Many writers may have only recognized and categorized signs of the actual root cause. How an issue becomes, a claim is a mystery despite the undeniable fact that building claims are a strain on the construction sector.

Utilizing specific analysis of root causes methods; there are efforts to identify the fundamental reason or core reason for conflicts and lawsuits. Utilized the technique of event evaluation to identify the root cause of building price overruns. Even though cost overruns are not in and of themselves claims or disagreements, cost delays in building initiatives can contribute to such occurrences. Utilized events analysis in conjunction with an expand-focus strategy to compile a comprehensive list of 146 possible causes culled from worldwide academic research and local experts. The collection was narrowed and combined using expand-focus to produce 15 universally independent fundamental causes. Using a cross-sectional questionnaire, 200 local construction professionals rated the 15 uniform causes based on how they perceived local significance and impact on cost overruns. According to the research, the three most common reasons are:

- Improper contract papers;
- Additionally, numerous modifications in proprietors' criteria or meanings;
- Unrealistically low successful prices for bids (suicide bidding)

1.5 Objectives

1. Conduct an in-depth examination of building disputes in major construction projects.
2. Recognise and analyse the varieties of claims and their root causes associated with building projects, as well as the kinds of claims recompense.
3. Identify and evaluate the agreements and assertions cited in the solicitation notice.
4. Identifying the extant loopholes in the claim management procedure and recommending the most efficient approach for efficiently overseeing the oversight procedure.
5. To shed light on the way the connection influences claims, thereby advancing the comprehension of current studies in a distinct setting.

II. Literature Review

Emre Cakmak and Pinar Irlayici Cakmak; (2013) have examined this document will analyse the main root causes of building sector disputes. To achieve this objective, a study of the literature was conducted to find frequent disagreements regarding construction. The disagreements based on an overview of the research were divided into major groups, and the principal reasons for disputes regarding construction were identified. Lastly, an evaluation was conducted employing the analytical network procedure (ANP) methodology to ascertain their relative significance. Initially, an exhaustive paper evaluation was conducted to identify the main reasons for construction-related disputes. Then, the disagreements based on the research were categorised into major groups.

Assegid Getahun, Yolente C. Macarubbo, and AlemuMosisa (2016) have examined this study has three main goals, all of which were met by the data gathered via the Survey, Case Investigation, and Documentation Review. The initial goal was to figure out the reasons for construction conflicts; the second goal was to determine the most prevalent causes of conflict; the ultimate objective had been to assess Current dispute resolution systems in the Ethiopian Somali territory's road-building industry. Consequently, design-related conflicts, contractor-related conflicts, owner-related disputes, contract-related conflicts, as well as external variables rank first through fifth, respectively.

Anita Rauzana (2016) has analysed that Building is a programme-based action requiring efforts from many different parties across multiple organisations, all of whom have their own interests in moving by means of the execution of a project. The level of detail, coupled with the vast array of unanticipated events, which can arise during a building endeavour, renders conflict inevitable.

Sagar Soni, Mukesh Pandey, and Sohit Agrawal (2017) cover the definitions and causes of conflict and dispute. An effort has been made to identify the causes of conflict and dispute, and the effective management of these causes mitigates their impact on the industry. Given the significance of the construction sector, it is difficult but not impossible to lessen the effects through improved leadership as well as interaction.

Abhishek Raj Singh and Dr Sanjay Tiwari (2015) elucidate the dynamic nature, adaptability, and efficacy of delivery approaches in EPC contracts for an improved megaproject building strategy. This paper additionally addresses the rationale behind employing the EPC contractual type as opposed to others, such as cost excess, time delay, etc. To address this problem, the sectors merged lump sum and full shrinking, culminating in a combined EPC/LSTK contract form.

Satish Kumar Viswanathan and Abhilasha Panwar (2020) Thus, the purpose of The purpose of this research is to construct a dispute causal model for understanding the interrelationships between the various causes of disputes. In order to achieve this, fourteen common causal variables were identified as well as confirmed a pilot study as well as a literature review. A dispute causal model was constructed through interpretative structural modelling (ISM) and a questionnaire survey to gather the opinions of 82 experts. The model illustrates a six-tiered hierarchy among the identified factors.

Bekithemba Mpofu and Edward G. Ochieng This investigation sought to identify the most significant reasons for construction delays in the UAE. An inquiry was conducted with consumers, contractors, and advisors as the primary stakeholder groups in mind. The analysis uncovered There are a number of significant reasons for delays in building in the United Arab Emirates, ranging from excessive contract durations to low labour productivity, alongside consultants as well as clients ostensibly enduring the burden of the "blame game."

N.B. Chaphalkar and K.C. Iyer (2015) Using the Case Study method and a questionnaire survey, this study establishes the intrinsic factors for construction disputes involving demands raised as a result of the variation in 72 arbitration awards and statistically demonstrates their importance in arbitral decision-making. In addition, it demonstrates the feasibility of the multilayer perceptron neural network approach for anticipating the outcome of a construction dispute by using a simulation model taking into account the case-specific intrinsic factors.

Hariharan Subramanya and Priyadarshi H. Sawant (2012), the results of the investigation are further divided into two categories for the sake of simplification and clarity. The first group includes Owner-, Contractor-, project manager-, finance-, along with resource-specific risks, while the second group includes project-, architect/consultant-, external environment-, as well as contract clause-specific risks.

Prasad K.V. and Vasugi V (2018) this will be the first study to identify the causes of delays for different categories of projects within a single country. The study also identifies and compares the causes of delay in DB and DBB undertakings. This research will aid professionals as well as project managers in India and other developing nations in mitigating causes of delays as well as improving project timelines.

III. Methodology

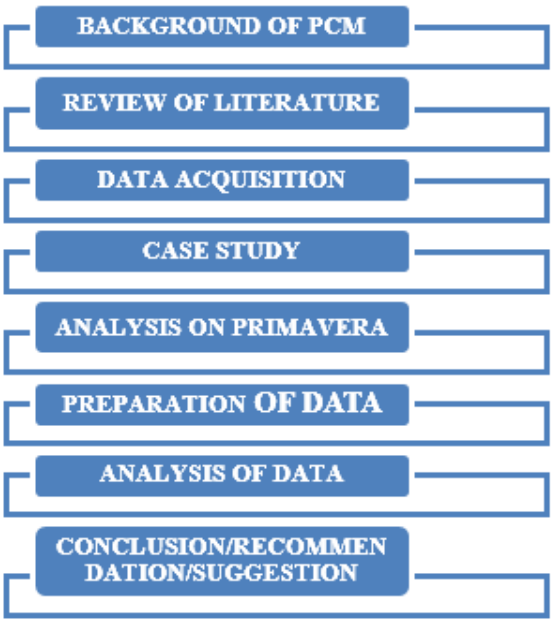

Fig 3. 1 Flow Chart

In order to enhance comprehension of the topic, qualitative methods were chosen as the interpretive method for gathering information in this study. This research examines case studies regarding the completion of infrastructure improvements in Maharashtra according to the EPC scheme. Primarily, research papers, as well as cases, serve as data sources. To obtain a broad context and backing in Bombay and from some of the initiative's experts. The additional information is going to be extracted from published sources. Using this method, data is gathered from the chosen site, and the specifics of the chosen scenario are explained in greater detail in this section. The information is analysed with the P6 Primavera programme to demonstrate the efficacy of the development management procedure, particularly in claims. The data was compiled through interviews with building sector leaders. The research was conducted in the following manner.

- Determined the initiatives that have become known as significant sites in the Maharashtra area.
- Studied the plans, projections, timetables, and operational methods in-depth and gathered all pertinent project information.
- Analysed the information collected and Primavera's use of tech to improve contract administration efficacy
- The recognition of contract dangers and mitigating guidance
- Identified all the deficiencies.
- Tracking repayments made to freelancers according to agreed-upon contract conditions to prevent any overpayments
- Figuring out the responsibilities and responsibilities of the numerous participants in the contract

3.1 Problem Statement

The primary causes of claims and disputes are the following four factors: Causes associated with the construction method, financial/economic causes, management-related situations, and contract-related causes. The most

frequent primary causes of subcontractor change claims are insufficient to design information provided to the subcontractor or when subcontractors submit change claims to resolve disagreements on their own. EPC refers to the engineering, procurement, and construction of solar systems ranging from small-scale solutions to large-scale solar projects. An EPC contractor's role is to provide engineering plans, procure equipment, and install it on the customer's property. The claim management process can be improved by filing claims without errors, training and retraining agents, streamlining the administration of healthcare claim denials, analyzing quality control measurements, and investigating claims for default.

- What are the fundamental reasons for building venture asserts? (Study of the root cause research)
- Which of the following are the underlying causes of vendor shift requests in EPC assignments?
- Which of the following issues have to do with the claim handling procedure for EPC projects?
- What role do the site expert and contractors play when disputes arise in EPC assignments? (Qualitative data)
- What enhancements can be made to the current claim administration method that has been implemented by numerous organizations?

3.2 Claims of the Employer (Sub-Clause 20.5)

As stated previously, the new Books not only offer a process applicable to Contractor's asserts but also one applicable to Employer's cases.

"If the company believes he has a right to any kind of reimbursement under any provision of these Terms or otherwise. As well as to a prolongation of the Defect Reporting a period of time the Owner or the engineer in charge shall provide notice and specifics to the Employer."

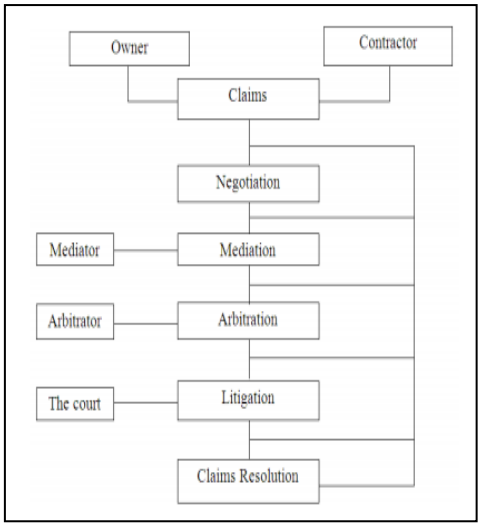

Fig. 3.2 Claims of the Employer

3.2 Contractual Risk:

1. Assess the scientific breadth of the offerings.
2. Evaluate the efficacy of the plan.
3. Evaluate price and terms of payment.
4. Consider the project spots and the associated risk of offering jobs there.
5. View your customer record.
6. Examine the agreement for your company's essential clauses (important commercial word when evaluating and discussing scope, schedule, and price).
7. Examine the Contract for optional clauses (do not include the option of terminating or suspending the arrangement if the customer violates it).
8. Examine the Contract for clauses pertaining to increased danger.

3.3 Research Gap:

According to the published review, no significant study has been conducted to analyze the effect of claims in EPC contracts. Bombay is an industrialized nation in which multiple multimillion-dollar initiatives provide the majority of job prospects for the state's workforce. With that in mind, work is being done to analyze the data employing Primavera in order to enhance the administration of cases in building projects.

3.4 PRIMAVERA

Numerous investigations have demonstrated that the primavera application has decidedly affected the profitability of arranging, planning forms and later its execution. It can potentially affect the whole life cycle of development undertaking to the furthest reaches. Primavera programming has the potential that influences the undertaking results emphatically and is adaptable. It is principally perception programming, which has improved the capacity to trade complex thoughts among venture members and give adaptability. Creating and reusing the data-related venture has turned out to be anything but difficult. This is a 'CIEPM' (Computer Integrated Enterprise Project Management) idea, which permits the significant extraction of venture the executive's information, data and learning from the members past their creative minds. Receiving this innovation gives the advantage to extend. Primavera keeps up with all data of the venture.

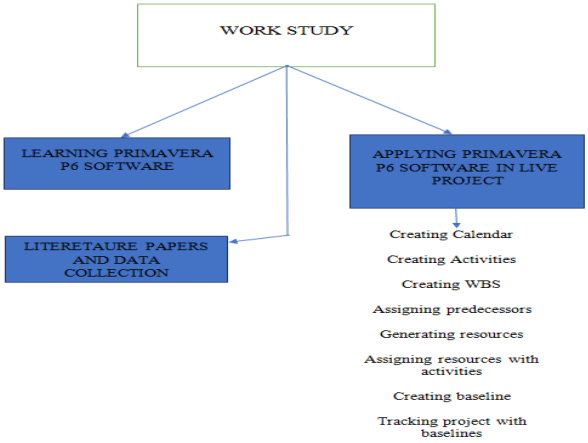

Fig 3.3 Flow of project

3.5 Primavera System

- Primavera framework is anything but difficult to work framework. Without much of a stretch, we can parity the asset that the executives of enormous development undertakings keep up with all information related to venture work.
- With primavera, we can, without much of a stretch, play out every single movement clearly and allot each assignment regarding assets accessibility.
- Using the primavera framework, we get the unmistakable vision of our undertaking. We can observe our asset on the board anticipating screen with date shrewd.

IV. CASE STUDY

4.1 STUDY AREA 1- Omerga Ausa

Fig 4. 1 Location of Study Area 1

- **For Omerga Ausa**

Upgrade Package-I from Km 0+000 to Km 47+800 of Omega Azusa to a two-lane layout with concrete shoulders in the nation's capital of Maharashtra.

Table 4. 1 General Cost Summary for Rigid Pavement Road

General Abstract Of Cost			
Length Of Project -(47.80 Km)			
Bill No	Item Of Works	Amount (Rs. Crs.)	% Of Total Cost
1	Site Clearance And Dismantling	2.13	0.86%
2	Earth Work	41.80	16.93%
3	Dec	20.20	8.18%
4	Concrete Pavement	119.40	48.35%
5	Slab, Box, And Pipe Culverts, As Well As Underpasses	18.10	7.33%
6	Bridges, Both Major And Minor	8.03	3.25%
7	Drainage And Protection Works	15.85	6.42%
8	Traffic Signage, Marking, And Other Equipment	1.81	0.73%
9	Bus And Truck Parking Areas	1.88	0.76%
10	Miscellaneous (Work And Utilities Along The Middle Of The Highway)	5.58	2.26%
11	Toll Plaza	3.98	1.61%
12	Junctions, Both Major And Minor	8.17	3.31%
	Total	246.93	
	Total Project Cost Per Kilometre (In Indian Rupees)	5.17	

4.2 AREA OF STUDY 2: LONAND TO KEDGAON

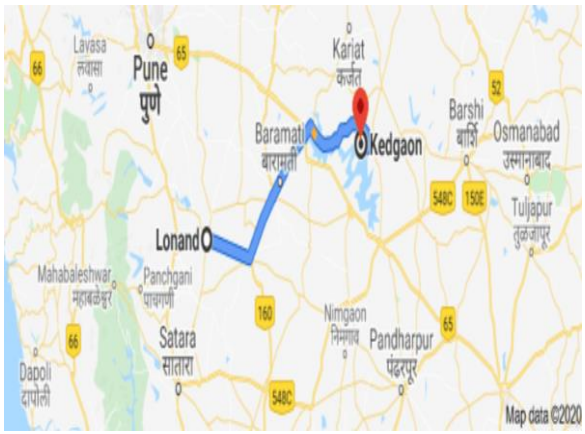

Fig 4. 2 Location of Study Area 2

Table 4. 2 Executive Summary of the Cost of Flexible Pavement Road (Lonand to Kedgaon)

Cost General Abstract

Project Length - (48,070 Km)			
Bill No	Item Of Works	Amount (Rs. Crs.)	% of Total Cost
1	Site Cleanup And Demolition	2.13	0.94%
2	The Work Of The Earth	41.80	18.53%
3	Granular Sub-Base	20.20	8.95%
4	Bituminous Courses	98.00	43.45%
6	Slab, Box, And Pipe Culverts, In Addition To Underpasses	18.10	8.03%
7	Bridges, Both Major And Minor	8.03	3.56%
8	Drainage And Protection Works	15.85	7.03%
9	Traffic Signage, Marking, And Other Equipment	1.81	0.80%
10	The Locations Of Bus Bay And Truck Lay Bay	1.88	0.83%
11	Miscellaneous (Middle Of The Road Labour And Utilities))	5.58	2.47%
12	Toll Plaza	3.98	1.76%
13	Junctions, Both Major And Minor	8.17	3.62%
	Total	225.53	
	Total Project Cost Per Kilometre (In Indian Rupees)	4.72	

V. Result And Discussion

Prepare Scheduling In Primavera

- Build EPS in Primavera
- The EPS (Enterprise Projects System) is a competent organisational tool.
- , significant, and progressing plan for your organization's numerous projects. This viewpoint on the organisation illustrates its geographic areas of responsibility.
- EPS is a hierarchical sequence of duties within an organisation.
- EPS consists of a Main/Root Node (The Enterprises/Organization) and some Nodes as well as Sub-Nodes that represent the various sectors with which this enterprise is involved.
- Once characterised, the EPS is not altered frequently or dramatically. Occasionally, it simply requires minor adjustments.
- The EPS was available to all current and prospective business operations

5.1 RESEARCH AREA 1: OMERGA AUSA

• **Plan Activities**

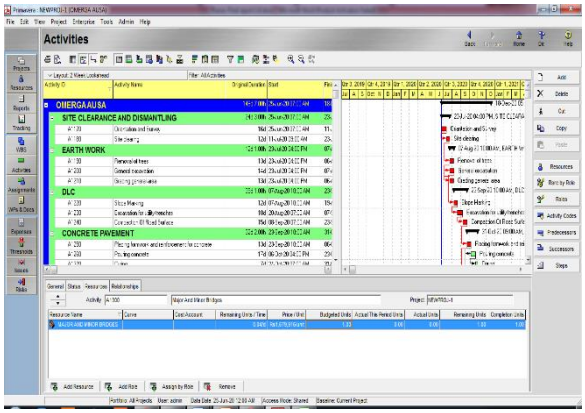

Fig 5.1 Plan Activities

• Designate Relationship

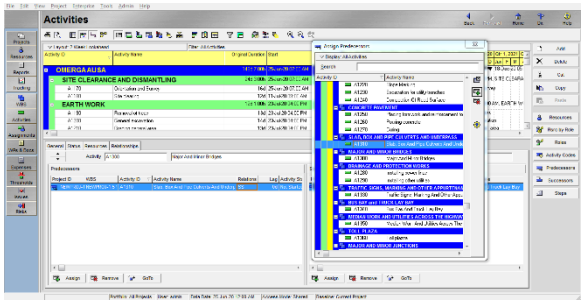

Fig 5.2 Designate Relationship

• Allocate Resources

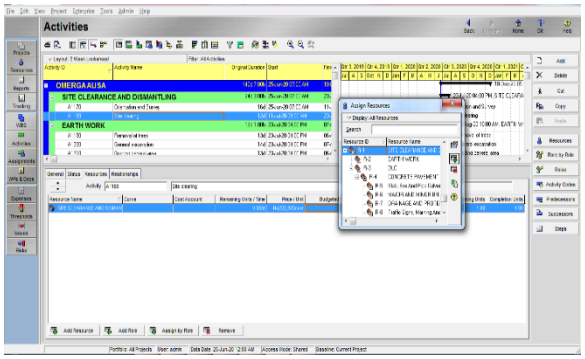

Fig 5.3 Allocate Resources

• Locate Critical Activity

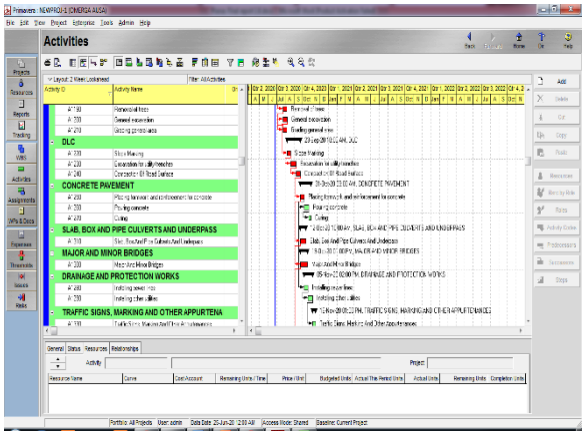

Fig 5.4 Locate Critical Activity

• Project's Total Duration

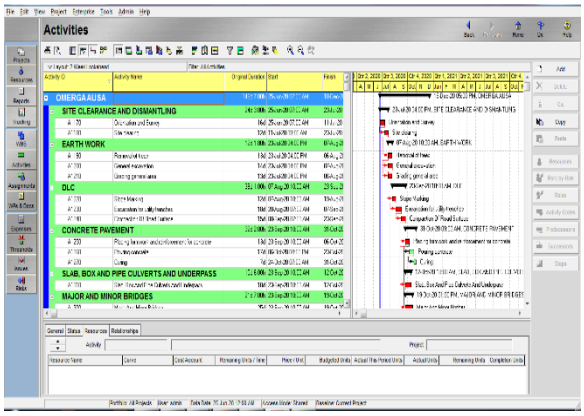

Fig 5.5 Project's Total Duration

5.2 RESEARCH AREA 2- LONAND TO KEDGAON

• Plan Activities

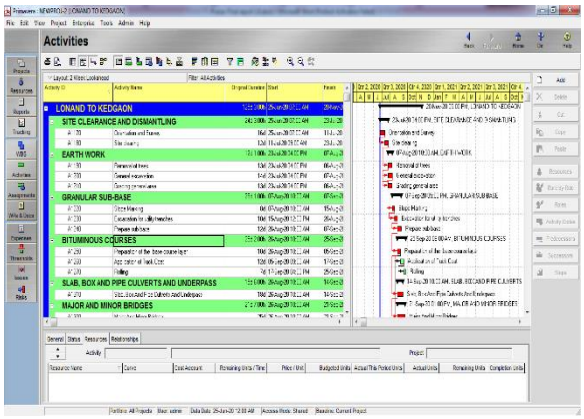

Fig 5.6 Plan Activities

• Designate Relationship

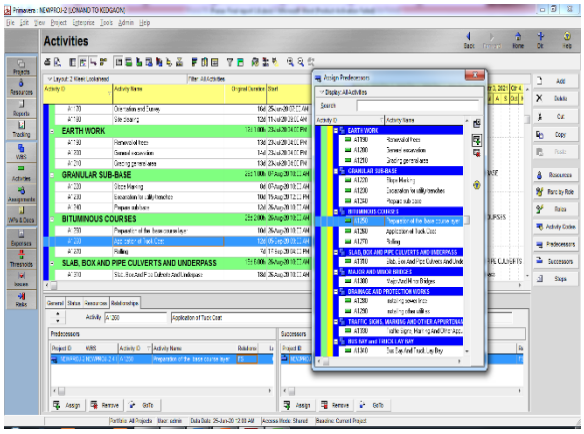

Fig 5.7 Plan Activities

• Allocate Resources

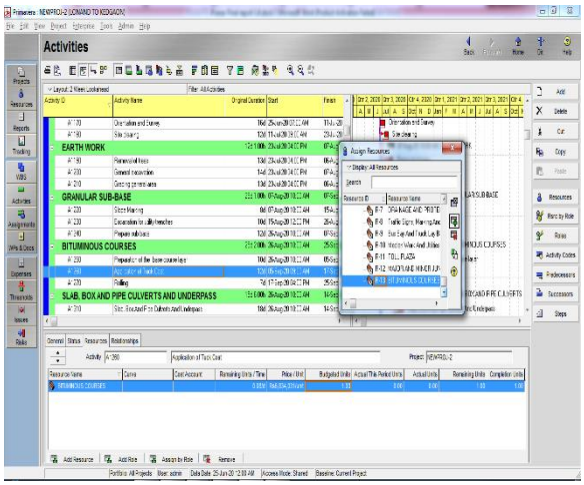

Fig 5.8 Allocate Resources

• Locate Critical Activity

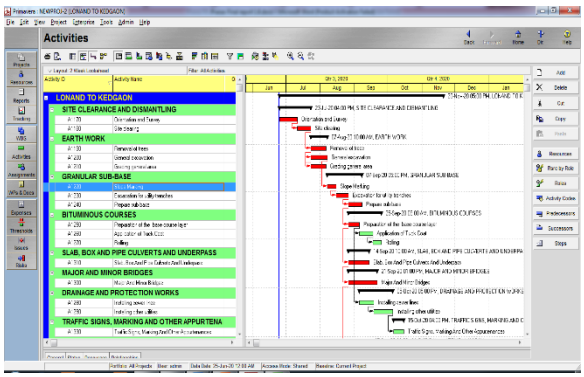

Fig 5.9 Locate Critical Activity

- **Project's total duration**

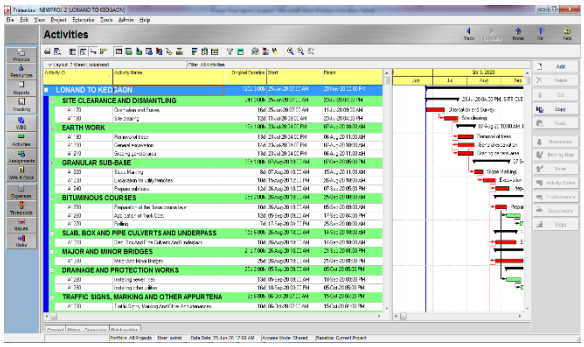

Fig 5.10 Project's total duration

VI. Conclusion

This study examined the effects of building claims on the accomplishment of an endeavour and the significance of effectively handling claims within contracting organisations.

From implementing the case analysis in PCM and analysing asserts, it appears that using the application and obtaining results required less time than performing the task manually. This reduces the energy, time, and staff designated for case processing.

This study incorporated a novel approach for monitoring project documents to reduce or regulate building claims and perform delay evaluation using Progress contract administration and Primavera P6 web-based programmes.

Recommendation

- They are implementing the PCM method in their organisations as soon as feasible to obtain the greatest benefits during all phases of the endeavour, especially when claims arise.
- Full Participation of every major stakeholder in the PCM method and the application of the PCM system to release their receipts will reduce the number of disputes originating from the execution of the project.
- Employees must receive successful instruction to attain the necessary documentation oversight throughout the job. Additionally, programme documentation and forms must be tailored to be consistent with organisational assets.
- Additional research is required in this genus to contrast processes and identify the simplest method for resolving allegations with little effort beforehand, getting to the Disagreement stage.

References

1. Emre Cakmak, Pinar Irlayici Cakmak BEM (2013), An analysis of causes of disputes in the construction industry using analytical network process, Social and Behavioral Sciences, Volume, pp.183-187
2. Assegid Getahun, Yolente C. Macarubbo, Alemu Mosisa, (Sep. - Oct. 2016), A Case Study on Road Projects in the Region, Causes of Conflicts and Disputes in Construction Projects, Assessment of Construction Dispute Resolution in Ethiopian Somali Regional State Road Projects, pp. 210-221
3. Stojadinovic , Z (2018), Claims and Construction Projects – Quantification & Prevention, pp. 83-112
4. Mohmmed Al Mohsin, Claims & Analysis of Construction Project in Oman Volume 2 (2012)

5. David Arditi, Thanat Pattanakitchamroom (2005), Selecting a Delay Analysis Method in Resolving Construction Claims, Volume (145-155)
6. Shaikh H, Zainum NY (2020), Claims in Construction Projects – A Comprehensive Literature Review.
7. Nor Azmi Bakhary, Hamimmah Adnan, Azmi Ibrahim (2020), A study of Construction Claim Management Problem in Malaysia, Volume (23),pp 63-70
8. Hesham A. Abdel Khalek, Remom Fayek Aziz (2019), Prepare & Analysis of Claims in Construction Projects using Primavera Contract Management.
9. Sagar Soni, Mukesh Pandey, Sohit Agrawal, (June 2017), Conflicts and Disputes in Construction Projects, Journal of Mechanical and Civil Engineering, Volume 13, Issue 5 Ver. VI, pp.44-48
10. Kongkoon Tochaiwat and Visuth Chovichien Chulalongkorn University, process (January 2004), Contractors' Construction Claims and Claim Management, pp.65-70
11. Jan Pícha, Aleš Tomek, Harry Löwitt (2015), Application of EPC contracts in International Power Project, Creative Construction Conference, pp. 397 – 404
12. Wenxin Shen, Wenzhe Tang, Wenyang Yu, Colin F. Duffield, Felix Kin PengHui, Yongping WEI, Jun Fang (Oct 2016), Causes of Contractors' Claims in International Engineering-Procurement-Construction projects, Journal of civil engineering and Management, Volume 23(6) pp.727–739
13. Abhishek Raj Singh, Dr Sanjay Tiwari, (July, 2015)EPC: An Innovative Tool for Mega Project Construction,International Journal in IT and Engineering, Impact Factor, Vol.03 Issue-07 pp.1-8
14. George E. Baram, (June 27, 2005), Project Execution in EPC/Turnkeys Contracts and The PM Roles and Responsibilities, AACE International Conference, pp.1-13
15. Yaser Motamedi Mohammadian1, Ali Zare, (2017) , Responsibilities in accepting dangers and risks in EPC/Turnkey contracts, Survey of Malaysian Law, Vol.14 pp.1-11
16. Matias Söderlund, June 2018, Claim management in EPC Projects A case study of claim causes and claim management during plant installation, Journal of Construction Engineering and Management,Vol. 3 pp 13-17
17. Arun Chandra Mohan and Vinay Mohan Agrawal, (2016) , A Comparative study on Indian Highway Construction Project, FIDIC and NHAI conditions of Contract, pp.148-152
18. Rahul Bali and Prof M.R Apte, (2014), Risk Management in EPC Contract - Risk Identification, Journal of Mechanical and Civil Engineering, Volume 11, Issue 1 Ver. IV (Feb. 2014), pp. 07-12
19. Kumar Viswanathan, S., Panwar, A., Kar, S., Lavingiya, R., & Jha, K. N. (2020). Causal Modeling of Disputes in Construction Projects. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, *12*(4), 1–11. https://doi.org/10.1061/(asce)la.1943-4170.0000432
20. Subramanyan, H., Sawant, P. H., & Bhatt, V. (2012). Construction Project Risk Assessment: Development of Model Based on Investigation of Opinion of Construction Project Experts from India. *Journal of Construction Engineering and Management*, *138*(3), 409–421. https://doi.org/10.1061/(asce)co.1943-7862.0000435
21. Chaphalkar, N. B., Iyer, K. C., & Patil, S. K. (2015). Prediction of outcome of construction dispute claims using multilayer perceptron neural network model. *International Journal of Project Management*, *33*(8), 1827–1835. https://doi.org/10.1016/j.ijproman.2015.09.002
22. Robert, B., & Brown, E. B. (2004). *Engineering, Construction and Architectural Management Bekithemba*. *1*, 1–14.
23. Venkatesan, V. (2019). Journal of Financial Management of Property and Construction Article information : For Authors Analysis of causes of delay in Indian construction projects and mitigation measures Journal of Financial Management of Property and Construction Article informa. *Journal of Financial Management of Property and Construction Article Information*, *March*.