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Analysis of Various Constraints and Application of TOC in Construction Project

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ABSTRACT

In any construction project there are certain hindrances which affect the duration of project and obviously on the total cost. The constraints in any project limit their achievement of high performance. Theory of constraints helps management focus on what's important by identifying individual constraints that inhibit the construction project from achieving its goal. Theory of Constraints is new concept of project management. It has been effectively used in the construction industry. The five basic steps of theory of constraints to remove the constraints are identifying the constraint, exploiting the constraint, subordinating to exploitation, elevating the system performance and repeating process. The purpose and scope of this study are to identify constraints in the construction project working environment and to use the theory of constraints, which gives direction for making decisions in the presence of constraints and suggest remedy to that constraints.

Keywords: Theory of constraints (TOC), Constraints , Construction Management

1.Introduction

Construction projects are complicated and time-consuming. To produce a satisfactory result, construction projects require good management, including functional satisfaction, aesthetic satisfaction, on-time completion, completion within budget, value for money, and health and safety.. Construction projects are inhibited by contractual deadlines, resource limitations, and safety, financial, and administrative constraints, to state a few. Complexity, one-of-a-kindness, and the presence of a range of stakeholder constraints differentiate construction projects. Higher performance is thought to be possible if constraints are well understood from the start.

A constraint is the point at which a project or activity fails to work as anticipated. The Theory of Constraints has benefitted industrial planning, production control, project management, supply chain management, accounting and performance assessment, and other disciplines of business, as well as non-profit facilities such as hospitals and military depots.

The Theory of Limitations will be used in the construction context to quantify the actual limiting effect on project objectives and the procurement process, because project development is similar to a production process in which productivity is affected by numerous constraints. Goldratt propose a five-step process to achieve continual improvement and to get the most of overcome.

Step 1: Determine the constraint in the system : The first step is to determine the weakest link in the system.

Step 2 : Decide how to exploit the constraint : Exploiting a constraint entails determining the source of the constraint and making the necessary changes or improvements.

Step 3: Subordinate everything else : Examine all other steps in the process to make sure they're all in sync and actually support the constraints requirements.

Step 4: Elevate the constraint : If Steps 2 and 3 did not suffice in removing the limitation, this step is taken. The limitation is removed at this stage by involving significant improvements.

Step 5: Go back to Step 1: To test the system's performance, the entire operation is repeated. Simultaneously, modifications to following constraints are accurately noted in relation to their impact on the constraints that have already been broken, avoiding solution inertia.

2. Problem Statement

As construction projects become more complex, proper planning and control of project activities have become critical issues in construction scheduling management. In general, one goal of construction schedule planning and control is to ensure that each project activity is completed successfully and on time. The Theory of Constraints can be used to improve project performance.

3. Objectives

1) To identify constraints in construction project.
2) To summerise the constraints in construction project.
3) To discover and provide the solution for constraints in construction project.
4) To implement solution for achieving a higher performance relative to good.

4. Literature Review

Lau, E. et al [18] identified the imperatives in the development project working environment and use the theory of constraints (TOC), which lays out step-by-step instructions for making hierarchical decisions in situations where imperatives exist. If requirements are better understood at the outset, it is assumed that greater execution may be assured by customers. Client demands in development are frequently discussed, but requirements do not appear to be perceived in setting. The restrictions were divided into five categories: 1) economic limitations, 2) legal limitations, 3) environmental limitations, 4) technological constraints, and 5) social restrictions. The impact of these requirements on the development project was investigated. They advocate paying special attention to watching and regulating the requirements in the development working environment in order to achieve excellent execution.

Şimşit et al [24] describe the true assessment of TOC in five times, which are also the names of Goldratt's books: I the optimised product technology era, ii) the target era, iii) the haystack syndrome era, iv) the its not luck era, and v) the critical chain era. By the 1980s, the focus had shifted to improved production innovation; investigations into the engineering of drum support rope began about the same time as the release of "The Goal" in 1984. Along with academicians and chiefs acknowledging the importance of TOC, researchers have begun to shift the focus to TOC measures, the thinking process, which is one of the most important TOC devices, and the five focusing steps, which include a continuous improvement strategy and critical chain project management. Although it began as an assembling methodology, TOC has evolved into a management hypothesis in terms of both methodology and application domains. TOC is still the finest technique for corporations after nearly 30 years.

Many development initiatives are abandoned before completion, according to the Mercedes Teruela et al [6] ,and the experimental proof has zoomed in on the predictors of progression, whereas failed projects have received less attention. For the period 2005–2013, they examined the impact of financial constraints on the likelihood of a potentially innovative Spanish firm abandoning a development initiative. Their research distinguishes between the impact of internal and external roadblocks on the chance of abandoning a project, and they investigate whether these impacts differ depending on the stage of the development cycle. They use a bivariate probit model to explore the convergence of monetary constraints and the decision to abandon an advanced project while controlling for potential endogeneity. Their findings reveal that monetary considerations had the greatest impact on the chance of surrendering during the initial stages. Furthermore, the financial sources are not impartial throughout the development project duration. Spanish companies are more sensitive to internal monetary sources during the planning stage than they are to external ones throughout the implementation stage.

Theory of Constraints (TOC) is new concept of project management. It has been effectively used in the manufacture industry. Dr. Mishra [4] suggest the idea of how the TOC is applicable to improve the project performance dealing with time constraint with a case of Sankosh-Tipling Road project and Bhimdhunga Lamidanda Road Project of Dhading District. Identifying the restriction, exploiting the constraint, subordinating to exploitation, elevating system performance, and repeating the process are the five core processes of TOC to remove constraints. When rescheduling the project, the Critical Chain Project Management (CCPM) technique took into account human behaviour characteristics such as Parkinson's Law and student syndrome. With the use of CCPM, it was determined that the project could be completed 30 weeks ahead of schedule. Although the situation may not be perfect and the project may not be completed 30 weeks ahead of schedule, CCPM ensures that the project is completed within the initially anticipated deadline through good buffer management. Thus, this study has assumed that project could be completed within previously proposed deadline if different counter measures which have been suggested with consideration of TOC.

Dr. D.N. Mudgal et al [5] find out the constraints for delays in infrastructure construction project work and recommending corrective measures for same. It is widely believed that greater execution may be guaranteed if requirements are better understood from the outset. Distinguishing and removing imperatives from bottleneck exercises reduces foundation development cycle vulnerabilities and increases venture board transparency. This analysis was based on a writing audit and a poll overview. A point-by-point poll research will be used to gather data for this assessment. The survey structure is emailed to various development firms and mailed to them in person. The goal of this inquiry is to successfully reduce the needs, which will aid in reducing unnecessary waste and loss of both money and time as a result of poor planning.

According to the Wieslaw Urban [27] following the TOCs procedures by focusing on the restrictions one by one is equally ineffective. The framework's limits should be exploited as a whole, resulting in a new degree of profitability for the entire framework. To achieve a higher level of efficiency, the manufacturing system must have adopted a hybrid improvement strategy that is aligned a variety of methods and tactics. According to the proposed manufacturing scenario, the improvement plans cannot just be focused on a bottleneck. They also require a thorough understanding of the creation process, including all cycles and other required criteria. The developing framework is a complex and multi-subordinate one, and improvement arrangements should be wisely made taking into account a variety of factors such as the company's business strategy, skills, information resources, monetary potential, opportunities, and so on. As a result, a sensible improvement plan should compel the chosen 'balancing point,' which is the new degree of global assembly framework efficiency.

5. Methodology

Identifying and removing limitations from bottleneck operations is the key to increasing and maintaining the transparency of construction project management and reducing the uncertainties in the construction process. The procedure for the methodology is as follows:

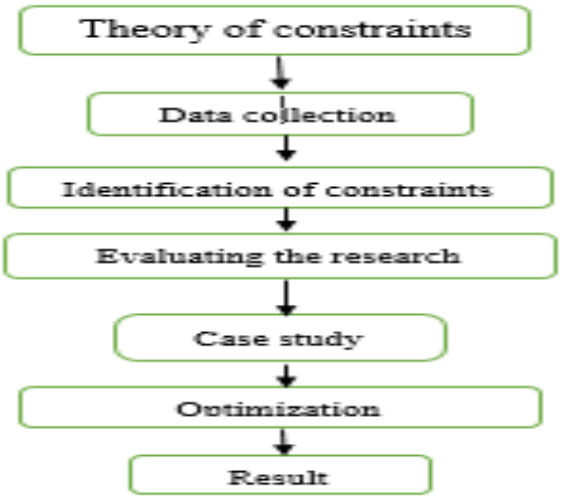

Figure.1 Flow Chart Of Methodology

For reducing constraints in construction project firstly collect all the preliminary information data through various literature reviews and questionnaire survey, by using this information identify the constraints. After the determination of main cause of constraints study the case studies regarding that constraints. Apply the five focusing steps of theory of constraint to give remedy that constraints.

6. Results And Discussions

Constraints are identified through a literature review, questionnaire survey, and case studies in this phase. Using the theory of constraints, analyse the restrictions and provide solution.

6.1. Environmental constraints:

The project should be environmentally friendly and humane, which means it should not hurt the environment. The Environmental Department should provide permissions and permits on a responsible note at every step of the project, particularly during the planning and design stages. This process takes time and has an impact on the timeline; delays in approvals cause project delays. Other technical constraints include those related to air quality, tree preservation, traffic

restrictions, and limits imposed by excavation permits. If we don't take precautions to manage hazardous trash, it will have a direct impact on site workers and others who live nearby. We can know about how to deal with environmental limits here.

- Limit fuel usage
- Properly dispose of waste
- Use sustainable materials
- Reduce noise
- Expedite project

6.2. Economic constraints:

Budget and allocation are the most common economic limitations. Due to budget constraints, the construction sector may not be the best option for achieving the project's goals and quality standards; this will have an impact on the project's progress. One of the major reasons for the building industry in terms stagnation is financial restrictions. To summarise, unmanaged economic restrictions have an impact on the project's quality, performance, functionality, and product. The construction sector not only constructs facilities that promote better productivity and higher living standards, but it also contributes significantly to the country's economy in the following ways:

- Creating opportunity for investing and profit making
- Provision of employment opportunities and training
- Support of business that cater to health and safety
- Affecting large-scale economic change due to its size
- Private finance initiative
- Promoting improved transportation systems
- Providing income for small businesses that provide related goods or services

6.3. Legal constraints:

Work law, supervision plans, and safety standards are examples of legal restraints, which arise as a result of the laws and regulations that govern the construction sector. In some cases, when new guidelines are published, the project's entire timetable must be updated in order to comply with the new rules and regulations. Here are several legal limits that can be mitigated.

- Planning permission
- Building regulations approval
- Health and safety
- Environmental consent

7. Conclusion

The goal of this research is to identify building project constraints and make recommendations for how to overcome them. All of the research mentioned above are largely focused with construction project restrictions. If one constraint is not addressed appropriately and promptly, it can lead to the formation of more constraints. The theory of limitations has the advantage of simplifying complex situations by giving unique and simple solutions. It helps management focus on the important things by identifying individual bottlenecks that impede the project from meeting its objectives. This paper provides an overview of constraints in construction projects, as well as how to use the theory of constraints to improve project performance and implement solutions to those limitations.

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