

THEORY OF CONSTRAINTS AND CONTRAVENTION ANALYSIS IN CONSTRUCTION PROJECTS

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Abstract - A constraint may be a condition, agency or force that impedes progress towards an objective or goal. There are variety of various sorts of constraint which will affect construction projects. Constraints should be identified, and described in the maximum amount detail as possible during the first stages of a project, in order that awareness of them and their potential impact are often managed. Even though the project seems similar, there may be contradictions in them. So in this project we are implementing a new methodology to solve the constraints and contradictions in projects.

Key Words: Theory of Constraints (TOC), Delays, Planning and Scheduling, conflict, dispute, success, construction projects, contractors

1. INTRODUCTION

Construction industries showing remarkable progression all over the country because of progressively fast-track and complex construction projects. Several projects facing great problems like constraints, conflicts and dispute occurrences. These problems became an extensive feature of the development industry. If these are not solved quickly they will worsen causing delays in schedule which ends up to claims that needs lawsuit measures to resolve them, loss of money & time. So it is necessary to reduce such constraints and contraventions through proper techniques.

1.1 Objectives

- ✓ Develop a methodology to overcome the constraints in the project
- ✓ Implement a new Construction contravention agreement (CCA).
- ✓ Model analysis and creating effective schedules against model analysis.

1.2 Scope

- ✓ Similar projects of same company may face different issues in execution.
- ✓ Different constraints play different roles in projects.
- ✓ Making a new construction contravention agreement (CCA) for project management system is challenging.

- ✓ Now a days government policies and force majeure is unpredictable

2. METHODOLOGY

It has been planned to carry out the work by study of constraints and contraventions in construction management through survey questionnaire and after collecting the data, are analyzed Relative Importance Index method.

2.1 Questionnaire survey

Through surveying which involved collection of distributed questionnaire involving various stakeholders involved in construction industries such as clients, developers, contractors, architects different construction firms. During the data collection stage, total 60 questionnaires were distributed over 50 companies

2.2 Case study analysis

For getting the results here we take a case study project, It is a Building construction project. It is a real time work of a hospital block. The project schedule is prepared using MS Project. The issue feel in the construction schedule is describes below:

- ✓ Lack of knowledge in project management & over confidence
- ✓ Not proper plans at basic level; basic plan: site work, foundation, super structure, facility management & finishing
- ✓ The schedule is too long due to poor time management
- ✓ The cost may also high due to contract change in every year
- ✓ Logical relation using in this schedule is start to start and lags, due to contracts
- ✓ Prefer importance to the functional managers, so WBS formation has issues
- ✓ Parallel running of non-critical activities are not preferred
- ✓ Facility management (piping, electric) works are repeating
- ✓ Sub-contracting is not much preferred (lift, MEP, fire fighting)

- ✓ Using same contracts & same calendar for every work
- ✓ Activities are unnecessarily repeated.

After studying the issues, the recommended changes and issue management techniques are explained below

2.3 Use project management

Project management framework is a subgroup of tasks, processes, tools and templates used by the management team in combination to understand the major structural elements of the project in order to initiate, plan, execute, control, monitor, and terminate the project activities all over the management life cycle.

2.4 Use better organisational structure

✓ Strong Matrix Organizational Structure

Here the project manager has the authority and a full-time role. A full-time project management team will report them and they control the budget.

✓ Balanced Matrix Organizational Structure

In this type project and functional managers share the authority. The project manager contains a full time role while project management staff are part time. Here the both managers control the budget.

2.5 Select a suitable contract type

Contracts are actually used for establishing business deals and partnerships. The parties involved within the business engagement decide the kind of the contract. Normally, the type of the contract used for the business engagement varies depending on the type of the work and the nature of the industry. The contract is just an elaborated agreement between two or more parties. One or more parties may provide products or services reciprocally to something provided by other parties such as client. The contract type is that the key relationship between the parties engaged in the business and therefore the contract type determines the project risk

2.6 Use quality management tools

✓ Six sigma approach

CIMA Official Terminology describes Six Sigma as a strategy supported TQM to realize very low defect rates. The 'sigma' refers to the Greek letter used to denote standard deviation, so 'six sigma' means that the error rate lies beyond six standard deviations from the mean. To achieve six sigma, an organisation must therefore produce less than 3.4 defects per million products. The two Six Sigma methods are DMAIC

and DMADV. DMAIC focuses on improving existing business practices. DMADV, on the opposite hand focuses on creating new strategies and policies.

Lean Six Sigma is focused the managerial approach that seeks to improve performance by eliminating waste and defects. Six sigma methods and tools are combined so that lean manufacturing or lean enterprise philosophy straining to eliminate waste of physical resources, time, effort and talent while assuring quality in production and organizational processes.

Fig -1: DMAIC Method



✓ Red tagging

5S Red Tags are utilized in the type process in your 5S or 6S program. During the type process workers sort through items within the area and use 5S Red Tags to classify items. Items are red tagged to eliminate what's unneeded or doesn't belong in your workspace. Then items are moved to a red tag area. This area holds the tagged items for a selected length of your time, and if the item isn't needed then the item are often disposed of from the red tag area.

2.7 Critical path method (CPM) for time management

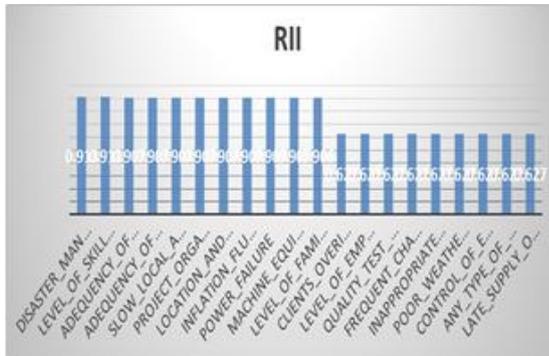
The critical path is a sequence of project network activities which add up to the longest overall duration anyways if that longest duration has float or not. This determines the shortest time possible to finish the project

3. RESULTS AND DISCUSSIONS

3.1 Reliability test

The value of the reliability was obtained by SPSS (Statistical Package for the Social Sciences) software. Cronbach's alpha is designed as a measure of internal consistency. Likert type scales used for the survey. 60 factors were identified and check the reliability of project. Reliability value obtained is .935, hence it is excellent. Based on ranking obtained graph is plotted.

Chart -1: Relative importance index graph



3.3 Case study details

Table -1: Tabular comparison

Sl.no	Subject of change	Conventional Project	Updated project	Effective difference Between	Effective Result
1	Start date	01 - 01 - 2020	01 -01 - 2020	NIL	N.A
2	Finish date	23-04-2022	1/2/2022	2 Months & 22 Days	Ahead of Schedule
3	Number of activities	194	105	89 Numbers	Easy to manage
4	Number of major WBS	12	15	3 Numbers	More visibility
5	Total Duration	724 Days	654 Days	70 Days	Less time to complete
6	Expected Budget	Rs:11,44,50,000/-	Rs:10,70,40,000/-	RS: 74,10,000 /-	Profit

3.4 APPLIED CHANGES TO THE CONVENTIONAL PROJECT SCHEDULE AND ITS RESULT SUMMARY

Table -2: Result summary

Serial No:	Conventional project	Developed New Project	Category Of	Expected Results
1	Activities are arranged as functional	Strong / balanced matrix mode and PM has more	Organisation matrix	Project is more visible in project management aspect.
2	Calendar follows the comfortable timing	Calendar follows possible working timing	Six Sigma and Lean.	Critical path can be optimised.
3	Relations are set with Start - To - Start type and apply	Relations are set as Finish-To-start and avoid the constraints between the	Organisation matrix change.	Avoid the repeated activities and grouping of activity is easy.
4	Costing is not considered for the	Primary costing is considered for the analysis purpose	Contract Management	Get an idea about the change in the budget of the project
5	No indications are included in the schedule	Indications with different symbols are included in the schedule.	5S and Red tagging methods	Simply identify the change in the schedule and easy of change management
6	There is no project auditing criteria	Projects can be audited based on DMAIC approach and the resources can be audited in 5S aspects	Six Sigma and 5S.	Measure the project performance in every aspects like time, cost, and quality and do the better resource analysis.
7	No Financial periods & no TCPI	If we need we can calculate Financial periods & TCPI	Contract Management	Based on the audit report we can change the type of contract and vendors for better TCPI
8	No issue Logs & Risk Register	Easy to develop Issue Log & Risk Register	Quality management systems	Easy to realise issues and risk from the auditing subsidiary reports
9	Non Baseline Project	Project can easily Base lined	Quality Management System	Keep the project as a Baseline for future similar projects and understand things easily by comparisons.
10	Not insured the projects and contracts system	Easily insure the whole project	Remedy against Forcemajure and Govt. policies	The created new project has less budget compared to conventional projects. So we can convince management and do the insurance for the future safety of the project.

3.5 CONSTRUCTION CONTRAVENTION AGREEMENT (CCA)

4. CONCLUSION

Table -3: Result summary

PERSONAL PROFILE

Name :

Address :

Designation:

PROJECT DETAILS

1. Name of the project (if possible)
2. Start date:
3. Expected finish date:.....
4. Expected budget:.....
5. Major constraints(if any):.....
6. Customer specific requirements:.....
7. Type of contract:.....
8. Mode of payment:.....
9. Details of memorandum of understand:.....
10. Details of specialities offered by company:.....
11. Details of insurance of project:.....
12. Details of other customers(if any) :
13. Rank the following issues in your organization? (Tick)

(1 = Highly Satisfied, 2 =Satisfied, 3 =Neutral, 4 = Dissatisfied, 5 = Highly Dissatisfied)

	1	2	3	4	5	Remarks
Time Management						
Cost Management						
Scope Management						
Labour Absenteeism						
Manpower Planning						
Work delay						
Labour Working hours						
Material Management						

PERFORMANCE RATING

Stages	Poor	Average	Good	Excellent
Initiation				
Planning				
Execution				
Management				
Review				

Signature _____ Seal _____

At present situation, though the project seems similar, there may be contradictions in them. We cannot eliminate these only by management level without associating all stakeholders. So a construction contravention agreement that is a CCA method should be there from the starting of the project ensuring the participation of all stakeholders to avoid the contradictions and also the constraints including design, economical, technical, social, time, management, legal and environmental constraints in them.

The solutions we discussed in this project are as follows:

- ✓ Use a project management and six sigma approach.
- ✓ Use a better management system instead of functional management
- ✓ Using different calendar for different type of works
- ✓ Assign a red tag system for better change management
- ✓ Provide facilities in sub contract aspects
- ✓ Use logical relation is as finish to start and parallel relationships.

By using these on the basis of CCA we can improve the performance of the project and helps to finish in the expected schedule.

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