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Identification of Constraints in Construction Projects to Improve Performance

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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. The aim and scope of this study is to identify the major constraints and their level of impact on the construction projects. For this purpose a proper set of questionnaire is sent to different government bodies as well as private contractors. These questionnaires were also sent to individual involved in any project from top to bottom level. The responses from everyone is recorded and used as a major tool of this study. From the responses it was observed that there are five types of constraints viz. legal constraint, social constraints, technical constraint, environmental constraint and economic constraint. Each constraint may occur individually or they may work as a series of problems. It was observed that at every stage there may be some constraint which may affect the total duration as well as total cost of the project. The management should be adaptive and alert for any situation to encounter the constraints.

Keywords: Theory of Constraints, Legal Constrains, Social Constraints, Technical Constraints, Environmental Constraints, Duration of Project.

I. INTRODUCTION

Basically the theory of constraints (TOC) says that a small number of constraints prevent any management system from achieving its long term or full time goals. "A chain is no stronger than its weakest link". Theory of constraints identifies that weakest link and lessens its vulnerability and applies to the process, organizations, individuals, whatever or whoever is a risk to the successful completion of project. The theory of constraints was introduced in 1984 by Eliyahu G. Goldratt, an Israeli business management expert but this idea has much deeper roots. A similar concept was developed in Germany in early 1960s by Wolfgang Mewes. It was not exactly the theory of constraints but it resembles with TOC close enough. Mewes called this the theory of bottlenecks, which is another way of saying constraints.

Every working environment faces constraints. However, there may be situations that we are completely unknown from the constraints or we ignore these constraints to achieve our project goals. Constraints are discussed in much more detailed way in management literatures but very few studies are performed on constraints in working environment. Construction working environment involves multi team participation and the need and constraints under such situation brings complications in such environments.

II. RESEARCH METHODOLOGY

A questionnaire is prepared and sent to all the stakeholders of the project such as government bodies, contractors, engineers, consultants, beneficiaries and local people. The data was collected in terms of quality and quantity both. Similarly primary and secondary data is also collected and analyzed in this study. Information and data collected from all the authorities is analyzed by simple statistical tools and techniques and presented in form of tables, charts and figures.

A. Primary Data

The main techniques of collection of primary data is

- 1) *Field Visit and Personal Observation:* The study area is visited. The project activities, its nature, it's complexity, work force, speed of work, geographical condition, location, social issues were observed. Informal meetings with the site engineers and supervisors was also conducted and tries to identify the issues and challenges in front of them while real execution of project.

- 2) *Questionnaire Survey*: A simple questionnaire was also supplied to all the stakeholders of project to collect the list of possible constraints in construction projects. These questionnaires were sent to government bodies, contractors, field engineers, beneficiaries and local people to identify constraints at different level. Questionnaire regarding status of projects, possible constraining factors, major work processes, availability of resources, scheduling technique, governing factors for time over run was asked to the project team members and also telephonic follow up was conducted to know their perception on construction project management.
- 3) *Desk Studies*: Desk study was conducted to identify the perception of stakeholders, their understanding and view regarding the project management aspects of the project. Desk study was carried out by close consultation with local project members, Consultant and client to understand the work flow methodology, characteristics of work, location of project, socio-political & Environmental situation as well as economic situation of the work.

B. *Secondary data*

Secondary data is collected in following manner

- 1) Literature Review
- 2) Publications of various researchers on Project management.
- 3) Other available literature, reports and journals.
- 4) Internet and websites.
- 5) Research Books.

C. *Data Processing and Utilization*

In order to identify the major constraints in construction project in this study we analyses the detailed progress charts of project and constraints which are hindering the progress of the activities of the project. For this purpose we collected the proposed schedule bar charts, project reports, interim payment slips.

Apart from that various field visits were also made in order to identify the views of all the stakeholders of the project. All the relevant data is processed and analyzed to identify the major constraints in project, constraints in scheduling, to determine the critical chain in work schedule submitted and to apply the theory of constraints (TOC) for effective scheduling of project. After collection of necessary data, opinion and information from selective respondents, the data was compiled and interpreted by suitable techniques.

III. RESULTS AND DISCUSSION

After the analysis of questionnaires, field observations and personal interviews of all the stakeholders of the project we found five major constraints in construction projects.

A. *Economic Constraints*

The economic constraints mainly occur due to budget limit and the allocation of funds. Due to the budget limit it may be possible that the adopted system of construction may not be the best option to achieve the project goal and quality.

As far as the money allocated to the project is not efficiently used it may also hinder the progress of project. The effect on the project is quality and performance of the project.

In single line, if the economic constraints of the project are not managed well it will affect the product, performance, function and quality of the project.

B. *Legal Constraints*

There are many rules and regulations are provided by the government and local bodies for smooth functioning of every organization and individual. These rules are for enforcing the work law, safety regulation and supervision. For example it is prohibited by the law that certain construction works should not be done on Sundays and public holidays. If these legal formalities are taken seriously during the planning of project it may be possible that on actual site it may not executed at same time span and results a delay in project duration.

C. Environmental Constraints

The government policies, public concerns and regulations require the environment to be protected such as air protection, tree preservation, traffic limit, noise control etc. In the project planning and designing stage, the responsible people need to go to the “Environmental Department office” to apply for the approval/justification for the project and get the approval before starting the real project on ground. This takes long time and it will affect the project progress and duration. If the proper approval is not obtained on time, the overall project will be delayed, or could not be carried out. There are also other constraints coming in picture from air protection, tree preservation, traffic limit, limit due to excavation permit for works, etc.

D. Technical constraints

Technical constraints generally refer to the processes involved in finishing the construction activities, and are often based on the practicality of building methods and standards. For example, in constructing a foundation, the site must be leveled before excavation and then formwork and reinforcement should be placed before concrete is poured. Each task must be finished before the next task begins; each task acts as a constraint on the next task. Other technical constraints may relate to construction tolerances, space required for construction operations, available storage or handling areas, site access routes and paths, co-ordination of services and etc. All these constraints will be linked to safety, health, and for the meeting with building regulations and control needs, as well as the client’s needs and any architectural and aesthetical aspects. Some will be very small and meaningless to some but can have a huge impact on the total project.

E. Social Constraints

No construction work can be done smoothly without the participation of local people. It is very important to take care of local people’s emotions and their sentiments about a particular place or thing. In highway projects it was very common that temples and mosques on road side create a lot of hindrance in progress of project. Since these things are related to people’s feeling, it is very difficult to solve such kind of problems. These problems can only be penetrated by mutual consent. The social constraints appear very minor and insignificant but very difficult to deal with.

The average score of each constraint are summarized in table 1.

Table I . Impact Level of Constraints

Type of constraints	Level of impact on construction projects
Legal constraint	7.6
Economic constraint	7.1
Social constraint	5.30
Technical constraint	6.7
Environmental constraint	7.0

This data is obtained by taking the arithmetic average of all the questionnaires obtained by multiple construction agencies. It was observed that most of the construction projects are heavily affected by the legal constraints. The economic and environmental constraints are ranked at second and third respectively. Social constraints are ranked in the last with low score. Technical constraints are also the second last in the table. Although technical constraints are placed at fourth out of five, it is also important for good quality of product. Social constraints play very vital role on project duration; if these constraints are not handled properly then it is impossible to complete the project on time. If technical constraints can be resolved in planning stage then they will be no longer available as a constraint, but these technical constraints take too much time to get resolved by the planning team even before starting of the actual project on ground. Sometime few very new technical constraints come into the picture from actual working environment and drastically affect the total duration of the project. The results also suggest that if one constraint is not resolved at proper time, another constraint may arise in picture and may affect the total duration of project. By understanding the type of constraints a project manager can understand the characteristics of constraints, and also find a solution and a perfect timing for implementation of that solution. The legal constraints, environmental constraints and legal constraints should be encountered at the stage of planning. On the other hand technical and social constraints are encountered in implementation stage of the project. A proper prediction of constraint, helps to make a good project planning and resource allocation.

IV. CONCLUSION

It can be concluded from this study that each constraints must be identified at the planning stage and there must be a plan for encountering these constraints. There may a number of constraints which cannot be either identified or they cannot be clubbed in the above studied constraints. Those constraints may also play a very vital role in implementation of the project. Economic, environmental and legal constraints must be identified and encountered in planning phase while others may be encountered on site. Social constraints must be solved by keeping an eye on the sentiments of local people. Management should ensure that proper amount of money, manpower and machinery is available for the implementation of project. On the other hand middle managers should have an adoptive management approach to encounter the natural constraints. We consider further study is required to identify the constraints and in other areas to understand complex nature of construction constraints.

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