International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 06 | June 2019 www.irjet.net p-ISSN: 2395-0072

A STUDY OF IMPLEMENTING LEAN & FAST TRACKING IN CONSTRUCTION PROJECT MANAGEMENT

Devika Vijayan[1], Minu Anna Johny[2]

[1]M. Tech student, Structural and Construction management,
[2]Asst. Professor, Department of civil Engineering, Indira Gandhi Institute of Engineering and Technology, Nellikuzhi, Kerala, India

---

Abstract – *In our present world construction industries are the main ingredient for the development. So due to the rapid growth in construction industry, it is not possible to manage the project through conventional ways. We have also observed in many cases due to Improper planning may lead to rework and produce many wastage such as over production, over run of cost and time, defects, accidents, unnecessary transportation etc.*

In this paper focus on strategies of lean and fast tracking. Fast tracking is the process of overlapping sequential activities and compress the schedule. Lean aims to eliminate all defects and minimize the wastage, give more value to the customer. More details collected through literature survey, by face to face interview and by questionnaire survey with contractors, project managers, consultants, site engineer. Collected datas are analyzed in SPSS. Summarize the result and suggest remedial measures.

***Key Words*: Fast Tracking, Lean principle, Six sigma, Delay management, choice of technology, Resource management**

1. INTRODUCTION

Construction industries are the main ingredient for the development of an economy. Presently the main challenges faced by construction industry to create certainty about delivery on time, on budget, quality and safety. The conventional methods have limitation to overcome these challenges.

Fast tracking and Lean are the two concepts used by many construction industries for improving there production. Shortening time-to-market has been one of the critical factor to the success. Fast tracking construction overlap the project schedule, thus reduce the project duration. Lean concept was introduced by Toyota in 1950s to improve there production by eliminating waste. Six sigma is a quality improvement technique introduced by Motorola in 1980s. In this paper makes an effort to implement both fast tracking and lean six sigma in construction management. The construction industries are transforming from conventional approach to fast tracking and lean management thus it will help to improve quality of work with effective cost and time by eliminating waste.

2. OBJECTIVE

- To identify & analyze the defects in construction using fast tracking and lean six sigma approach.
- Detail study about the strategies such as Delay management, Resource management, Choice of technology.
- To reduce the waste in construction and to harmonize the non-value added activities through lean principle.
- Comparison of conventional and modern method of construction.

3. SCOPE

- Fast Tracking & Lean six sigma provide a structured method of improvement to reduce waste, reduce cost & time.
- By implementing Lean systematically reduce
- wastage of material and increase productivity.
- By collaborating fast tracking and lean will definitely increase the profit and productivity of an organization.

4. FAST TRACKING

Fast tracking is a schedule compression technique .Fast tracking can be applied during planning stage or can be applied on a delayed project. By rearranging the activities and by schedule compression we can overcome the delay in time and cost, for construction it is a important factor. At the same time fast tracking arise the risk of rework, without proper planning fast tracking may lead to risk.

4.1 STRATEGIES OF FAST TRACKING

4.1.1 Delay Management

Delay in construction means the overrun of cost and time beyond the delivery date as specified in the contract or the delivery date agreed by the customer. In construction it is considered as a major problem. To overcome this situation the planning part should be strong. This research indicate project delays have commonly occurred in most of the

construction projects including government and private projects. This situation van be avoided by maintaining proper communication with stakeholders.

4.1.2 Resource Management

Resource management the planning of resource to meet the requirement of the project and to satisfy the customer. The main objective of resource management is the availability of adequate resource at right time, should ensure the maximum utilization of resource. Without proper planning may cause delay in project and become unprofitable. Resource means not only the material it can be money, man power, machine etc.

4.1.3 Choice of technology

Choice of technology is a critical ingredient in the success of a project. In selecting alternative methods and technologies, it is necessary to formulate a number of construction plans based on alternative methods or assumptions. Once the full plan is available, then the cost, time and reliability impacts of the alternative approaches can be reviewed. This examination of several alternatives is often made explicit in bidding competitions in which several alternative designs may be proposed or value engineering for alternative construction methods may be permitted. In this case, the contractor prepare plans for each alternative design using the suggested construction method as well as to prepare plans for alternative construction methods. By using latest technologies can save time, cost, material and can improve the quality.

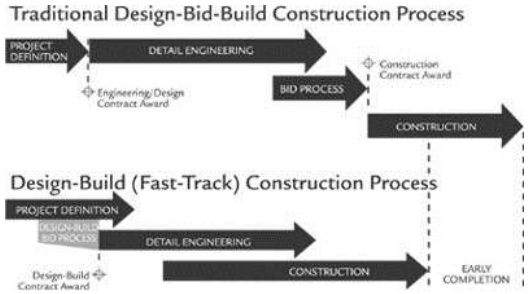

Fig:1 Comparison of conventional process and fast Tracking process

5. LEAN

Lean philosophy was first introduced by Toyota in there manufacturing. Sir John Egan defines it in this way, "Lean construction presents a coherent synthesis of the most effective techniques for eliminating waste & delivering significant sustained improvement". Lean construction principles basically involve elimination of waste, especially within the process, in a strategic and considered manner, and by creating continuous flow, Lean strategy is to add more value to the customer. Waste can be defined as anything which do not add value to the customer. Types of waste are, Waiting (people, material, operation), Unnecessary transport (double handling), Inappropriate processing (larger machines, unnecessary steps, machines not quality capable, over design), Material stocks (early deliveries, storage space, deterioration), Unnecessary motions (ergonomics, bending, reaching), Building defective parts/sections.

5.1 Concept of Lean Six sigma

The concept of six sigma was introduced in 1980s by Bill Smith, while he was in Motorola to eliminate the variability and defect for customer satisfaction. According to the study, in construction 40% value added activities and 60% non-value added activities or waste.

Figure 2: What is waste as understood in lean thinking?

Various lean tools are:

Value stream mapping:

"VSM" is the most commonly used Lean Construction tools for identification of the sources of wastes. It creating a visual map of the flow of materials and information from suppliers to consumer. The main objective is to identify the different tasks and to distinguish it into value added and non-value added categories.

Just in Time:

"Just in Time" is another effective tool in Lean Construction tools to eliminate non-value-added activities and to reduce process variability. The concept of this process is that the stocks which do not bring added value to the customer (internal or external) should be considered as sources of wastes. So, the materials and equipment must be available only when it is necessary.

Kanban Board / Card:

Supply management using "kanban" cards is a very effective technique to ensure the minimum amount of materials, depending on the real needs of the site construction. It provide a solution to storage problem by tracing the working areas so each one of them will have his own storage. In addition to that, we can use mobile storage blocks, equipped with wheels for the movement. Thus it will help to reduce many sources of waste.

Last planner system (LPS):

Construction companies required different level of planning at different levels and at different time during the life of the project. We assign the tag of "The Last Planner" to

the individual person or a group who produces the assignments or projects. Planning in the organization tends to focus on achieving particular objectives and these objectives drive the lower level planning processes that specify means for achieving those ends.

Figure 3: Last Planner system

5'S' Technique:

5S approach allows keeping the construction site more organized than before, reducing damage to equipment/materials by improper storage, and increasing the safety of personnel.

- Sort (eliminate that which is not needed)
- Set In Order (organize remaining items)
- Shine (clean and inspect work area)
- Standardize (write standards for above)
- Sustain (regularly apply the standards)

Visual aids:

This enable workers to be well informed about production procedures, status and other important information for them to do their jobs as effectively as possible. Large visual displays are generally much more effective means of communication to workers on the factory floor than written reports and guidelines and therefore, are used as much as possible. The targeted and the real production level are made visible to everyone so is the current situation of a production line. Charts, metrics, cards, tables, procedure - process documents, visual indicators are extensively used. Visual management also helps to create transparent working environment.

DMAIC METHODOLOGY

Define: Define the problem. Define the customer and their requirement.

Measure: Determine how the process currently performs and ensure the data is reliable.

Analyze: Examine the process and verify the causes of the problem.

Improve: Select practical solution and implement it.

Control: Ensure the process is properly managed and monitored. Apply improvements to other area.

Figure 3: DMAIC methodology

6. METHODOLOGY

1. Literature Review
2. Questionnaire Survey
3. Data collection
4. Analysis using SPSS Software
5. Result and Discussion

6.1 Questionnaire Survey

The survey questions are prepared based on the literature reviews and by considering the strategies of fast tracking, lean six sigma. The questionnaire was conducted across some districts in Kerala.

6.2 Data Collection

Questionnaire survey were collected through mails, phone calls and by visiting sites. Datas were collected from Project managers, site engineers, consultants, contractors through face to face interviews and phone calls. Around 40 companies were visited and only 25 companies responded to the survey.

6.3 Analysis using SPSS Software

Statistical Package for the Social Sciences (SPSS) is developed by H. Nie, Dale H. Bent, and Hull . It is used for Used for logical batched and non –batched statistical analysis. The scale used for the measurement is five point Likert scale

- 1-Never
- 2-Rarely
- 3-Some times
- 4-Very often
- 5-Always

6.3.1 Reliability Test

The collected data were checked for reliability using cronbach's alpha value. Higher degree of reliability is obtained if the value of cronbach's alpha is

>0.9 - Excellent(Very high reliability)
0.8 - good

0.7 - Acceptable
0.6 - Questionable
0.5 - Poor
<0.5- Unacceptable

The obtained value for lean and fast tracking is in between >0.7-<0.9, so the result of questionnaire survey is acceptable and can be used for this research.

RELABILITY IMPORTANT INDEX (RII)
RII calculated by using the formula

$$RII=\sum w/AN$$

Where w= weight of scale
A= Highest weight (5 in this case)
N= Total number of respondent

6.3.2 RESULT AND DISCUSSION

In this survey 62.5% was the response rate with respect to the companies we approached. Based on 3 main strategies of fast tracking:

Delay Management

Based on delay management the cronbach's alpha value = 0.781.

- Good weather condition is essential for smooth running work, rainy season may affect fast track construction.
- Power failure and equipment failure may slow down the work.
- Space constraint is another factor which affect the work mainly in road, bridges etc.
- Payment Delay or fund is the major factor which affect the work. Obtaining finance to execute the work on time is a big burden for the contractors.

Resource Management:

Based on resource management the cronbach's alpha value = 0.801.

- Shortage of Material is a major issue faced by the construction industry.
- Shortage of skilled labor is another important problem. For modern construction method we need skilled labors.

Choice of Technology

Based on the choice of technology the cronbach's alpha = 0.806.

- As per the survey response, most of them are still following the conventional methods for in there projects.
- Availability of skilled labors is essential for implementing latest technology.
- The application of some technologies and heavy equipment may directly or indirectly cause environment degradation.
- Fund is another problem for implementing new technologies and equipment.

Based on **Lean method of construction** the cronbach's alpha value = 0.902.

- Good availability of resource is an important factor.
- Quality Assurance: By using new technologies can ensure the quality and efficiency.
- Training program for labors: Lack of training Program based on Lean.
- Specific criteria should be used to measure the productivity
- Use estimating and project planning software's helps to avoid the difficulty to control and execute the work.
- Management considering lean initiative as an added cost.
- Labours attitude and are not willing to change

Remedies to overcome the issues by using Fast tracking and Lean

Without proper planning and execution fast tracking and lean may also cause risk of rework, overrun of cost and time etc. But by proper planning and execution we can run the project on time, budget and can increase the profit with ensured quality.

6.4 Suggestions to overcome the issues by using Fast tracking and Lean

- Detailed study about the project
- Keep a good coordination between all the parties involved.
- By using modern technologies
- Frequent meetings should be conducted
- Optimize the level of inspection.
- Use visual job site display to communicate project information.
- Do tasks in parallel by proper planning.
- Standardize
- Reduce and recycle
- Eliminate the things that are not used.
- Conduct training programs to all the workers.
- Use of proper financial management.
- Use best alternative methods.

7. CONCLUSION

In the present condition timely delivery, cost overrun, quality, profit are the main issues faced by the construction industry. By implementing Fast tracking and Lean concept we can overcome this challenges. Execution of works with the

Standard Quality requirements reduces rework and hence the cost for it. Fast tracking reduce the project duration. The 3 strategies which causes delay in fast track construction are Delay management, Choice of technology, Resource management. Lean Six Sigma principles which give a systematic framework to identify the impact of defects and their root causes and eliminate the waste in the process. By using this techniques delayed project can bring back to schedule.

REFERENCES

[1] Mohamed Saad Bajjou ,Anas Chafib, and Abdelali En-NadiMehta, " The Potential Effectiveness of Lean Construction Tools in Promoting Safety on Construction Sites" International Journal of Engineering Research in Africa,Volume 33 Issue 7 Version 1.0 Year 2017

[2] Vinaya D. More1, Dr. Shrikant Charhate2 and Madhulika Sinha, " Lean Construction Techniques in Indian Construction Industry: Some Analysis " International Journal of Civil Engineering Research, Volume 7, 2016

[3] John A Gambatese,Catarina Pestana,Hyun Woo Lee" Alignment between Lean Principles and Practices and Worker Safety Behavior" ASCE, Volume 143, Issue1, January 2017

[4] Balavenkatesh s1, Arulselvan s ,(2017) " Analysis of Cost Overrun in Fast-Track Interior Fit-Out Projects" International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 04 | 2395-0072

[5] P M Wale1, N D. Jain, N R Godhani2, S R Beniwal, "Planning and Scheduling of Project using Microsoft Project" Volume 12, Issue 3 Ver. III (May. - Jun. 2015),

[6] Oguntona O A and Aigbavboa C O (2018), An Assessment of Lean Construction Practices in the Construction Industry, International Conference on Applied Human Factors and Ergonomics,524 – 534,

[7] Abbasian Hosseini and Nikakhtar (2012), Flow Production of Construction Processes through Implementing Lean Construction Principles and Simulation, IACSIT International Journal of Engineering and Technology, 4, 475 – 479.

[8] Saad Sarhan (2018), Institutional Waste within the UK Construction Industry: An Exploratory Study.

[9] B. Indhu, and P. Ajai (2016) , Study of Delay Management in a Construction Project - A Case Study, International Journal of Emerging Technology and Advanced Engineering , Volume 4, Issue 5

[10] M. Haseeb, Aneesa Bibi , M. Haseeb, Maloof-udDyian , Wahab Rabbani and Xinhai-Lu (2011), Problems Of Projects And Effects Of Delays In The Construction Industry Of Pakistan Australian, Journal of Business and Management Research Vol.1 No.5 [41-50].

[11] Arif ramzan rahemtulla (1988), Pre contract procedure and design management of fast track projects, Canadian Journal of Civil Engineering, volume3 issue 4

[12] P. Fazio, Moselhi, and P. Thaber (2011), Fasttracking of construction projects: a case study, Procedia Engineering 14 2552–2557 4.

[13] Rhuta Joshi, Prof. V. Z. Patil "Resource Scheduling of Construction Project": Case Study 4.438 Volume 4 Issue 5, May 2015. [2] Abhishek sharma,and K.K.pathak "Manpower Planning, Scheduling and Tracking of a Construction Project Using Microsoft Project Software "