"STUDY OF LAST PLANNER SYSTEM IN CONSTRUCTION INDUSTRY"

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ABSTRACT

In traditional management work is broken down into smaller packages and activities and allocated specific time duration for the completion of the activities using critical path method. CPM method considers the float for the non-critical activities through which these activities can be delayed so the total time of the project is not affected but the greatest disadvantage of CPM is that it does not consider the time required for the information and material flow. But taking into account the dynamic nature of the construction industry information and material flow presentation becomes very important. This representation can be done with the help of the LPS.

Last Planner manages the relationships, conversations and commitments that together enable program & production planning decisions to be made collaboratively at the lowest possible level in a whole range of one-off production settings software development, ship building, yacht fit-out, construction and other examples of one-off production. With adaptations, LPS works in new product development and design too.

Keywords: Last Planner System, Lean construction.

1. INTRODUCTION

Construction industry in India is the second largest industry after the agriculture and accounts for over 11% of the GDP and generates employment for about 33 million peoplein the country. The construction industry is highly fragmented in which only Percent of the total 250,000 can be classified as medium to large firms.(Bhatla A.).Construction industry is suffering from the problems of low productivity, inferior working conditions, inferior quality, poor safety management, poor communication and continuous cost and time overruns. Traditional method of the project management that is CPM which iswidely used by most of the industries in developing countries like India has been suffering criticism due to the growing needs of domestic and international competition construction of highly complex and uncertain project. Again in traditional management all the cost and time overruns are mostly attributed to the contractor's failure to follow the schedule and budget designed during the construction. Most of the times the Planning from the top management is responsible for such a failure as it does not incorporate manyuncertainties which are necessary to be highlighted during the scheduling. All thesethings provide road way to move towards the theory of Last Planner System.

new knowledge. That is to say, this study is concerned with the application of existing principles (LPS) to a new context and different working environment where commitment and attitude to time make it likely to operate differently. This study was undertaken to improve the quality of work in practice, to solve practical problems and tocontribute to knowledge. The research described in this paper is devoted to

evaluating the effectiveness of implementing LPS to improve construction planning practice and to enhance site management in the Indian construction industry.

1.1 Purpose of study

Construction industry is one of the developing industries of today that has a great impact on the economy of any nation. The construction industry makes a vital contribution to the competitiveness and prosperity of the economy. A modern, efficient infrastructure is a key driver of productivity, and the construction industry has a major role in delivering the built infrastructure in an innovative and cost effective way.

Material, Money, Manpower and Machinery are the four 'M' and Time is essence of construction industry, which plays very important role. Good project management in construction must rigorously pursue the efficient utilization of labor, material and equipment. For improving performance of construction management we have to check feasibility of Last Planner System in Indian construction industry.

1.2 Objectives of proposed Work:

The objectives of proposed work are:

1) To study concept of Last Planner System

2) To Implement LPS in few construction activity of ongoing construction site.

3) To identify barriers in its full implementation in construction industry.

1.3 Organization of Research

The first chapter provides background information about the importance of Last planner system in the construction industry. The purpose of the study is included in chapter one as well. The second chapter provides overall literature study of Last planner system. Chapter three explains detailed concept of lean construction with 4 different toolsof lean construction. Chapter four provides complete description of how last planner system works with its implementation possibilities in conjunction with various factors.. This chapter also provides ideal methodology derived as a conclusive result of entire study to implement LPS to its highest efficiency and the benefits that can be achieved using this system. Chapter Five presents proposed last planner system together with its application to the case study. The last chapter summarizes the procedure and findings of research, its contribution, and barriers observed to its full implementation.

2. LEAN CONSTRUCTION

Introduction of Lean Construction

Lean construction is a combination of operational research and practicaldevelopment in design and construction with an adaption of leanmanufacturing principles and practices to the end-to-end design and construction process.Unlike manufacturing, construction is a project-based production process. Lean construction is concerned with the alignment and holistic pursuit of concurrent and continuous improvements in all dimensions of the built and natural environment: design, construction, activation, maintenance, salvaging, and recycling This approach tries to manage and improve construction processes with minimum cost and maximum value by considering customer needs. Construction industry has been suffering enormously from a serious drawback, Which is “Waste”. All the researchers conducted in the area of construction waste imply the huge volume of waste generated during construction project. During last

decades, various methods are utilized in order to reduce construction waste and its effects. One of innovative approaches in this regard is "Lean Construction",which was introduced to construction industry in 1990s based on a successful manufacturing theory, i.e. lean production. Actually, Eliminating waste in a process isone of top priorities in lean construction theory . In general, project managers interpret waste as physical construction waste, which dominantly includes material losses. In addition to stressing on the physical waste, lean thinking specifically pay lots of attentions to the waste produced over a construction process. Waiting time, non value adding works and material transportations are categorized in this group.

3. LAST PLANNER SYSTEM & IMPLEMENTATIONMETHODOLOGY

3.1 Introduction-

This technique Promises to make programmes more predictable by using short- term planning and minimizing the waste and non-value adding work and making the assignments ready for the work.It was developed to increase defectiveness of planning and control by making programmes more predictable thereby improving the chances of delivering the project on time.(Abdullah O. Alsehaimi).LPS is based on panoptic cooperation between various consultants, contractors and subcontractors who commit to coordinate their activities in increasing detail to establish the most practicalimplementation approaches. Furthermore, at the end the last and the most detail schedule plan is prepared based on experiences with regard to what caused diversion between planned and actual implementation. It identifies all the prerequisite tasks and constraints present for a given task and ensures that all the prerequisites are completed and constraints those present are removed prior to the beginning of the task.

3.2 Components of Last Planner System

1. Master planning 2. Phase scheduling 3. Look-ahead planning 4. Weekly work plan
5. Percentage plan complete

Fig. 3.1 Last planner system process

(Source- www.AGC.org/lean date- November 18, 2017, 1:28:38 AM)

4. CASE STUDY

This case study involves construction of (G + 4) residential building. As time period for case study was confined for 2 months it was not possible to apply all four phases of last planner system .Initially one week

was provided as trial for weekly work planning and after that formulation of look-ahead plan started. Initial master plan and phaseschedule were prepared but as time period of case study was confined it was not possible to execute pull technique for preparation of phase schedule.. Again updating of look- ahead plan on weekly basis was not possible as it's a course of practice which needs considerable time to achieve this level. This must be considered as drawback of this work.

The Last Planner System is applied to actual construction site on some of activity. RCC construction of two floors and brickwork was the activities of construction. The construction site was located in Ahmednagar.

The details of building are as under

Residential Building (G+4) Address Savedi Ahmednagar.Total Area = 383 sq.m
Built-up Area = 262 sq.mBeam = 16.28m3/floor Column = 9.346m3/floorSlab = 31.3 m3/floor

Rates of Labour
1 Carpenter= Rs 700 /day1 Helper = Rs 400/day

1 Skilled = Rs 650 /day

1 Unskilled =Rs 500 /day

1 Mason= Rs 600 /day

1 Male mazdoor = Rs 400 /day 1 Female mazdoor =Rs 300 /dayRates of Material

Aggregate = Rs. 1500 per brass River Sand = Rs. 4000 per brass Crushed Sand = Rs. 3000 per brassCement = Rs. 280 per bag

Bricks = Rs. 9 per piece

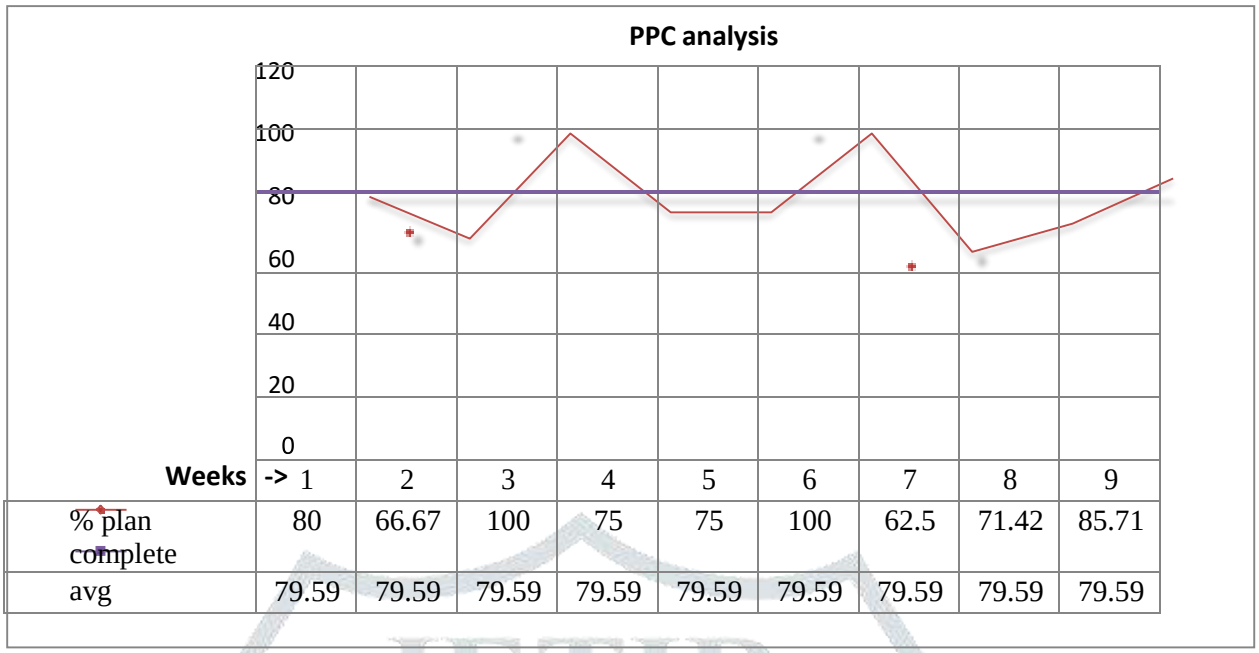
Weeks Look Ahead Plan

Following table explains the look-ahead plan of 6 weeks from case study. Itrepresents constraints observed and persons responsible for the removal of same constraints.

Assignment	Constraints	Person responsible
1.RCC 1.1- COLUMN 1.1.1-Reinforcement 1.1.2-shuttering 1.1.3-Casting 1.2- BEAM 1.2.1- Reinforcement 1.3-SLAB 1.3.1- shuttering 1.3.2- Reinforcement 1.3.3- Casting	1. Material 1.1. Aggregate:5.664 m3 1.2. River sand: 5.664 m3 1.3. Crushed Sand: 5.664 m3 1.4. Cement: 200 bags 1.5. Steel: 4500 kg2.Men 2.1. Carpenter-2, helper-2, 2.2. Skilled worker-2, unskilled worker -1 2.3. Slab Casting Gang(2 mason, 10male majdoor, 6 female majdoor) 3. Cost 3.1. Aggregate- ₹24000/- 3.2. River Sand- ₹64000/- 3.3. Crushed Sand- ₹48000/- 3.4. Cement Bags- ₹112000/-3.5. Steel- ₹419000/- 3.6. Construction Cost- ₹243000/-	Men and Material- Manager (Mr. Dattatray Gawade) RCC- Supervisor1 (Mr. Saif Shaikh)
2. Brick work 2.1 Prop Removal and site cleaning 2.2. Soaking and staking of bricks 2.3. Line out and brick work	1. Material 1.1. Bricks- 24000 nos. 2. Men 2.1. Mason-3, Female Majdoor-3,Male Majdoor-3. 3.Cost 3.1. Bricks- ₹216000/- 3.2. Construction Cost- ₹149600/-	Men and Material- Manager (Mr. Dattatray Gawade) RCC- Supervisor2 (Mr. AkshayKalapure)

Table 4.2 PPC Analysis

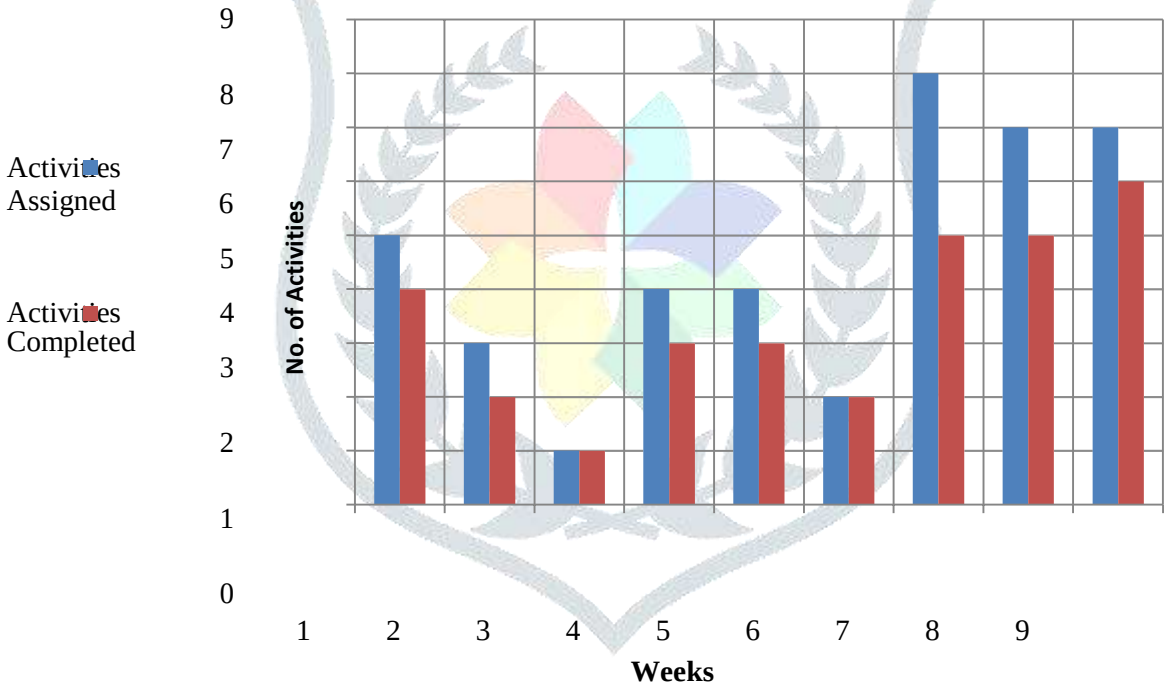
WEEK	1	2	3	4	5	6	7	8	9
Peccentage Plan Complete	80%	66.67	100 %	75%	75 %	100%	62.5%	71.42	85.71
Activities completed	4	2	1	3	3	2	5	5	6
ctivities Assigned	5	3	1	4	4	2	8	7	7
Reasoms of incompletion	Over commitment	Column shuttering break, rework	- rework	Supervision & checking	Labor problem	-	Supervision & material delay	Labor problem(19 feb)	supervision



Weeks ->	1	2	3	4	5	6	7	8	9
% plan complete	80	66.67	100	75	75	100	62.5	71.42	85.71
avg	79.59	79.59	79.59	79.59	79.59	79.59	79.59	79.59	79.59

Graph 4.1 PPC Analysis chart

WWP summary



Graph 4.2- WWP summary

Overall Cost and Time Saving

After application of Last Planner System, reduction in cost is as follows-

1. Material
    a) Steel = Rs. 31500
    b) Cement = Rs. 16000

Initial Cost of Steel was Rs. 38 per kg and for cement bag was Rs. 280 per bag. But in view of manager, there was a possibility of price hike and it was observed as one of the constraint in look ahead plan and the prediction was true, price hike was by Rs. 7 per kg of steel and Rs.80 per bag of cement bag.

2. Men

   a) Labour = Rs. 13200

   b) Supervisor and manager = Rs. 4800

By the implementation of LPS, there was time reduction by 3 days for per floorconstruction which resulted in cost saving as mentioned above.

Overall Cost reduction using LPS-

= (31500+16000)+(13200+4800)

=Rs. 65500

Concluding remark

For last planners to increase plan reliability to the desired level requires the coordinatorsof the projects on which they work embrace the Last Planner system's objectives and especially the look ahead process, which is dedicated to making tasks ready for assignment and to balancing load and capacity. For their part, last planners must adhereto the discipline of Last Planner rules and perhaps also use the PPC learni

ng tool of LPSsystem consistently and well.

5 CONCLUSION

6.1 Conclusion-

LPS proved to be very effective approach in planning, improving coordination amongst participants, better collaborative management and information flow. Analysis of this literature study shows that training for LPS in essential in order to achieve full implementation as alteration in participants work identity must be feasible with hisprevious desired work practice. Study reveals that LPS is not expected to have greater impacts when applied for shorter interval; repetition of look-ahead schedules ,WWP and PPC measurements with learning process will improvise work flow in longer periods of implementation as it will produce an experiential learning cycle.

Understanding the causes responsible for variation observed in learning phase of LPS and initiating appropriate action over these causes using applications of risk assessment matrix, excel spreadsheets, time buffers, information flow software's, social subcontracts , action research etc. will enhance effectiveness of LPS.

Top management plays the key role in successful implementation of LPS asadoption of this technique will reduce the power of autonomy by delegating the decisionsto the involved participants in process. This study contributes in learning theory behind last planner system, understanding the key implementation factors, barriers to its full implementation and renowned benefits of Last Planner System.

6.2 Barriers-

Most common barriers observed from study are-

- Stubborn attitude i.e. resistance to change
- Partial implementation of LPS
- Faulty presentation of PPC components
- Inadequacy in reliable commitments during LPS implementation
- Lack of training for LPS implementation or ill-defined understanding of systemcomponents.
- Non supportive top management in fear of delegation of authority.
- Inadequate use of information generated during implementation.
- Short term vision, bad work environment or lack of collaboration

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