

To Study about Lean Construction Technique Utilizing and Building Information Modeling (BIM): Application, Benefits and Limitation

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Abstract - Building information modeling be used to support method changes designed according to lean construction and lean production principals. To begin to answer these questions we give theoretical analysis of the interaction of building information modeling and lean construction for improving construction. BIM (Building Information Modeling) has recently attained widespread concentration in the AEC (Architectural, Engineering and Construction) industry. Project of Management that had been so far do not work like it and were new project of its kind are one of the troubles that were faced by managers then, presented information about these project very low and execution of them have high risk because management about project process have been any conception for this reason, most of these projects have been done by trial and error base method, because there was no capability to planning for problems that will be happed. Born in manufacturing goals, require a new method to coordinate action, one that is relevant to industries far removed from manufacturing. Lean construction beside with its various tools like the just in time, pull approach, total quality management a lot of momentum in the develop nations. In this paper explain the basic comparison of the two techniques like BIM and lean construction.

IndexTerm- Building Information Modeling, Planning and Project control, Information Flow, Lean Construction.

I. INTRODUCTION

BIM (building information modeling) and Lean construction are effecting fundamental change in the AEC (architectural engineering construction) industry. Whereas the both are conceptually independent and separate, there appear to be synergies between them that expand beyond the essentially circumstantial nature of their approaching development conporaneously.

Changes and complexities in construction projects were indivisible components and these complexities and changes were not associated only to the design phase, often has been seen in the construction phase particularly in fast projects due to the dealings of construction and design. Therefore, in the complex projects successful design management for quality wok in the on time and with assigned resources is important. BIM is a procedure development and use of a simulation model of design, planning, construction and the building operation that it is a set of rich data and information of all building parts during its life cycle and intelligent communication all member with each other, as a result that by making change in a small member of these set all other member attuned with them. So this technology has been used for decision-making in order to get better the construction and operation.

Lean construction project is extremely different compared to traditional construction project management wherever Lean approach aims to maximize concert for the customer at the project level, set well defined objective clearly for design concurrent product, delivery process and applies production control all through the life of project. Usually, lean approach breaks the construction project to lesser parts of activities which will be defined clearly the start and end date for achievement of each activity with an selected person to keep on monitoring the all the activities to be completed according schedule.

II. THE BENEFITS OF USING BUILDING INFORMATION MODELING TECHNOLOGY

The majority of the projects in the world have been performance with this technology which established the benefits of using building information modeling technology. Here we mention a few of the benefits of Building information modeling:

1. Saving Time: Project Implementation saving time, there are all preparation stages and execution of a project with exact time in the building information modeling and that is to be prepared martial before specific time to use it and operations sequences that made saved the time of project. Since of the common visualization project opening to work on the other hand, executive engineer can previously specified the location for the installation of cranes, lifts, materials storehouse location and predicted operation of the enlistment the manufacture to can run this without useless time.
2. Cost Saving: The project has been availed as three dimensional while applicable based on building information modeling; on the other hand building information modeling recognized all projects parts that warming and overlapped to removal it. Building information modeling provided extremely accurate estimate of the projects materials that prevented the bought excess and shortage of materials and in turn saving costs.
3. Increase safety in Construction: Implementation of all project location details are specified in the building information modeling accordingly, official site could recognize locations and high-risk areas in the workshop and imagine about overcome

the risk plus identified the location of evacuation and exit throughout emergency and warned to workers. Simulation model of Project is very closed to reality thus; it can be used for training of worker and told them safety points in the different places.

4. Loss Claims: Claim outbreaks construction a project has forever been essential part and occur almost in all projects. Difficulty, the long duration of the project implementation and dissimilar interpretation of the parties be caused claim.

Having three dimensional model of the project previous to implementation to parties regulation all matters out about difficulty, extra time and different interpretation of work. Thus this approach reduces the occurrence of the claim in project management and the assignment process.

III. LIMITATIONS OF USING BUILDING INFORMATION MODELING TECHNOLOGY

Building information modeling is a development process and using of a simulation model for design, construction, planning and operation of building which, it is a set of rich data and information of all building parts during its life cycle and intelligent communication all member with each other. Building information modeling have some limitation which are explain below:

1. Software and Hardware cost, Purchase costs of Building information modeling software package greatly other than the two-dimensional CAD model and requirements of hardware are more costly similarity. Now a day approximately CAD applications on all laptops available, but according to the complication and heavy depiction which done with Building information modeling software, have been necessary to special computers with highly functional.
2. People training costs required, training should be given to communicate people about to work for new system and have been justified made Investment. Building information modeling must be trained to all who associated with structural and architectural design and also mechanical and electrical to have proper control over construction process complication.
3. Employing Professionals cost and expert Specialists that should be obtainable to the project implementation who are control the software, recognize how to applicable it throughout the project life cycle that building information modeling manage are the main dependable and consist three team included Structural Engineer, Design Director and Project Architect.

IV. APPLICATIONS OF BUILDING INFORMATION MODELING IN CONSTRUCTION MANAGEMENT

Here, there are applications of BIM in construction managements are explain below:

1. Phantom design substitution of design decisions with group members and employer has been one of the most apparent uses of building information modeling both for constructor and developers. Finally visualization of the project on specifications and two-dimensional drawings were difficult for various. The three dimensional building information modeling model consequently, in addition showed the completed project as a capability, virtual to switch Array of information systems, also products and material used in its construction. Building information modeling on the other side allows to simulate different scenarios have been run or construction and accessible analysis of different alternatives to the project group.
2. Evaluation the Stages of Construction and Assist to the preparation one of the significant benefits of building information modeling is that allow to contractor and its group member before the process analyzed and tested different methods and instruments are required. This is prepared revelation of the potential problems timely that execution process will be a great challenged if it's late discovered. So this analysis on the other side leads to verify the standards of quality and safety estimate of construction.
3. Enlistment planning, one of the serious issues related to the management of the project site is a enlistment planning which will have been a important contact on the overall success of the project. The project contractor and manager with used of building information modeling could make depiction about study aids available and prepositional, evacuation, access routes in case of risk and safety issues, excavation and piling planning, emplacement of martial depot, how to collect surface water and numeral of scenarios has been considered for that plus if one of them accepted, the consequences informed to whom concerned in project and if required neighbors by contradictory.
4. Construction operation sequence and schedule is one of the majority issues in the construction management process is a construction scheduling and planning. These efforts have been continuous and monitored constantly for that the project did not get out of the right way. If by adding scheduled data to three dimensional structural information the fourth-dimension that it is a time added it. Usually forth-dimensional model help to those who are concerned in the project can be visualized schedule and found out virtually correct sequence of manufacturing operations how successful is the achievement of the project.
5. Operation planning and Implementation workshop of building information modeling information in arrange to determine the materials location and systems in the workshop is appropriate after the coordination of the whole project. Building information modeling information transferable to the surveying equipment directly.
6. Maintenance and operation, the responsibility theory to the project "from the cradle to the grave" is a one of the more elegant of using building information modeling which integrated operation and maintenance after finished project. In accumulation, all information about material, products and systems installed in the project were connected to the manual used directly which used by its charge.

V. APPLICATION OF LEAN CONSTRUCTION

The lean construction application tools to the construction process will be described in this section. The basic construction process is considered as:

- Planning
- Design
- Scheduling
- Monitoring
- Execution

➤ Controlling

Lean construction application principles to design management as:

1. Having a few degree of flexibility in the design activities sequence. Not essential activities in a very well level of feature and encouraging group work.
2. Association of designers in joint solutions.
3. Direct communications between designers and customers.
4. Precise and strong relation of supplier client.
5. At all times working with a set of design alternatives.

By the integrated models is creation, the allocate of wasteful actions can be reduced, production value can be increased by additional accent on customer's requirement and variability can be reduced by falling the number of steps occupied in the design process; times cycle and most significantly continuous development can be built into the process.

Lean construction principles application in construction planning: they have highlighted the information that the construction planning process mainly widespread today is that of developing a single plan and adhering to it for the complete duration. Those plans are rarely reviewed during the implementation stage and the corrective actions only consist of adjusting the original schedules to actual performance. Toward improve the process planning they have recommended a shift towards possibility planning which considered preparation of numerous detailed plans prior to effecting for various project environments. Thus the require to review the original plan for problems very rarely arises.

6. Phase scheduling, when lean construction uses the pull technique for project schedules development.

In that way only those tasks are executed and scheduled whose conclusion releases work to other tasks. Consequently, only the work that is required complete and so that prevents any over manufacture .The phase schedules provide as a source for look-ahead schedules development. In process of the phase scheduling, all organizations involved representatives in the phase sit down to settle on the work that must be performed to release work to other phases. Subsequent to all sheets are on the walls, the diagram of network is arranged by shifting and moving of sheets. Therefore new methodologies and techniques for doing the work are found out. The sequence is finalization of the activities; durations are applied to them.

7. Last Planner system and Look ahead process S The last planner systems and look ahead process involves the subsequent processes as: explosion, screening and make ready.

Explosion: Explosion involves exploding the mentioned activates in the master schedule to good details to recognize all the pre requisites for the activity earlier than it enters the look ahead window.

Screening: Screening process involved is to use for determining the status of tasks that are present in the look ahead window based on their pre requisites. At this time we can desire whether to go forward or delay the tasks based on their status.

Make ready: In make ready process the lead time is predictable, the pre requisites are pulled and the work is executed. Make ready process requires great caution as the times of ordering have to be estimated dependably to prevent any catalog from building up at site. This work then enters the effective backlog so that the work scheduled can begin. This work is monitored by using Percent of Planned Complete (PPC) and the incapability to achieve a high Percent of Planned Complete is investigated for process development and to prevent the problems from re occurring.

Percent planned complete:

Percent planned complete is the method apply for the project monitoring. Unlike the earned value estimate technique which is usually used for projects monitoring, the techniques of measurement has the following some advantages:

- The workers are work selected themselves and thus there is less chance of time over run.
- The non conclusion causes of work are mentioned clearly while analyzing Percent planned complete.
- Percent planned complete helps in constant improvement of the construction project as efforts are through to prevent the re occurrence of problems.

VI. LEAN CONSTRUCTION PRINCIPLE

The conventional management project practices treats all the behavior in construction as value adding accordingly and activities the construction process is a conversion based process in which one value adding activity leads to another. Lean construction model pressurizes the available resources to act fast thereby resulting in cooperation in the construction quality. On the other side, lean construction is a conversion and flow based model where a construction process is a conversion collection processes connecting flows of information and materials from one process to the other as depicted in Figure. Illustrate in Figure.1 lean Construction principle project planning cannot be performed in detail much before the events being planned. Accordingly, deciding what and how much work is to be done by a design squad is seldom a matter of simply subsequent a master schedule established at the beginning of the project.

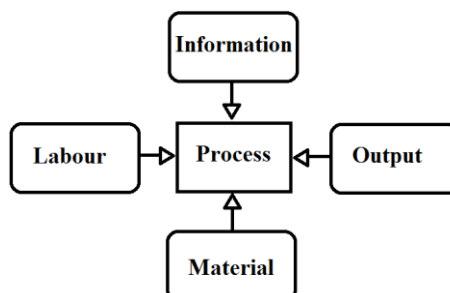


Figure:1 Principal of Lean Construction

Now, it is significant to understand where the basic differences lie between Lean construction and traditional construction philosophy and Table 1 is summaries the basic differences and demonstrates where lean philosophy innovation strives against traditional practice.

Table 1 Basic Different between Lean Construction and Traditional Construction

Lean Construction	Traditional Construction
Active Control system	Reactive Control system
Optimization at a project Level-rewards several crews concerned in the delivery of major work packages	Optimization at individual active level-rewards individual crew presentation.
Builds leading the basic project Management Body of Knowledge infrastructure instituting a various approach to project management	Relies on individual modernization within the PMBOK
Planning of the short-term and control of jobs improves time task completion, importance on workflows between crew without interruption not self interest.	In traditional scheduling and practice methods such as CPM play a big role in project identification and scheduling of milestones, Higher emphasis on whole project scheduling, with little attention to short-term workflows.
Lean construction is highly effective for uncertain and complex project	Traditional construction is highly effective for predictable and simple Projects.

The basic comparisons shown in Table 1 the scope for modernism regarding where lean philosophy can take affect within the construction industry.

VII. CONCLUSION

The construction industry is a complex facilitator of highly specialize processes and legislature, all working to achieve timely, profitable facility and high quality and structural resources. The construction industry is mostly dependent on demand factors within the economy and can be significantly affected by theory and trend structures. Lean construction has been analyzed in conditions of the considerable opportunities present inside the philosophy that will improve the efficiency and innovation in the construction industry. The term LPDS (Lean Project Delivery System) has undergone systematic assessment as to where the main benefits lie for improvements within conventional systems. Basic changes such as the improvement of increase lean thinking, collaboration, structuring and project level optimization have been identified as the possible catalysts for modern development within the construction industry. Consequent complete analysis has been performed on the LPS (Last Planner System), which has exposed inadequacies in scheduling and conventional planning and wherever considerable improvements can be utilized by integrating the last planner system into construction projects. We concluded that addition feasibility of these techniques into conventional practice, resulting in a fair argument for the implementation of both the training, physical systems and development required for efficient execution of lean models.

Collaboration modeling of Lean Construction and Building Information Modeling have been discussed as a possible future output for construction perform, though, it is unclear as to while, how this integration will occur. Important barriers must be overcome and models standardization may be essential in order to facilitate effective control and integration, and also minimum risk. After this paper we concluded that report has evaluated the effectiveness of traditional construction perform in expressions of the essential processes that exist to facilitate effective and successful delivery of construction projects. These processes have been established to be insufficient in a number of main areas such as planning, collaboration and scheduling. Significantly, these inefficiencies have been recognized as innovation through opportunities the integration of lean construction methodology. Successfully, this is where lean construction holds unrivalled value inside the construction industry. Integration barriers still be specifically in relation to rational growth and technical leaning of systems; though, these can be reduce with the right considerate and conceptualization of the primary benefits that lean construction will deliver to construction projects.

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