

LINKING SIMULATION CONCEPTUAL MODELING TO CONSTRUCTION PLANNING: A LAST PLANNER® DRIVEN APPROACH

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ABSTRACT

The Conceptual Modeling (CM) phase of simulation studies encompasses the thinking process of how a simulation model should be developed, how it relates back to the real system, and what decisions can take place to shift system performance towards the intended one. In a project management context, CM incorporates the planning phase of simulation projects. This study explains how simulation CM can be integrated with the Last Planner® System (LPS), which is considered the most established lean-based construction planning method. This integration is accomplished by presenting a combined CM/LPS framework that matches elements of CM with the LPS. On the one hand, the integrated CM/LPS framework aims at utilizing the time and effort of the LPS to build the conceptual model. On the other hand, CM can help improve the practices of the LPS by promoting creativity and problem-solving.

1 INTRODUCTION

There is a consensus in the construction research community that simulation modeling suffers from a lack of large-scale adoption within the industry. Among the reasons identified are the need to invest considerable time and effort to develop simulation models and the lack of technical simulation training among construction practitioners. Based on the observation by Bernold (1987), introducing high technologies to the construction industry requires integrating the technologies with the traditional methods of construction. Therefore, this study aims at addressing the gap by establishing a link between simulation modeling and the current practices of construction planning. CM incorporates the planning phase of simulation studies as it provides a software-independent description of the simulation model. Van der Zee (2012) concluded that aligning CM with engineering management contents can help in integrating simulation modeling into engineering practices. Thus, CM can be matched with construction planning to initiate a link between simulation and construction. The LPS was selected for the integration with simulation as it is a well-established construction planning methodology which has gained popularity within the industry due to its ability to stabilize construction production and to increase plan reliability.

2 THE USE OF SIMULATION MODELING IN THE LAST PLANNER SYSTEM

According to Ballard and Hamzeh (2007), the LPS starts with *Master Planning* stage to define project logistics, major milestones, and initial duration and budget. Next stage is the *Phase Scheduling* which defines the detailed activities of each phase. Next, a *Lookahead Planning* stage takes place where the activities are broken down into processes, constraints are identified, and responsibilities are assigned. Finally, the *Weekly Work Planning* (WWP) stage represents the plan at the most detailed level before construction.

In general, simulation modeling has been utilized in the LPS literature as a tool to test research hypotheses and to facilitate improved understanding. However, there is a lack of research on integrating the practices of simulation modeling with the LPS to support industry practitioners. Xie (2011) asserted that an

interesting relationship can be identified between the LPS and simulation. However, his observation was limited to matching the elements of the WWP with simulation models.

3 THE INTEGRATED CM/LPS FRAMEWORK

The integrated framework utilizes the main stages of the LPS to build up a conceptual model as summarized in Figure 1. It can be concluded that most of the information needed for CM can be obtained from the LPS especially the lookahead planning stage where a detailed construction operation design takes place. As it is too late to collect data for the conceptual model during the WWP, it is excluded from this framework. However, data collected during the WWP can be used to update and validate the computer model.

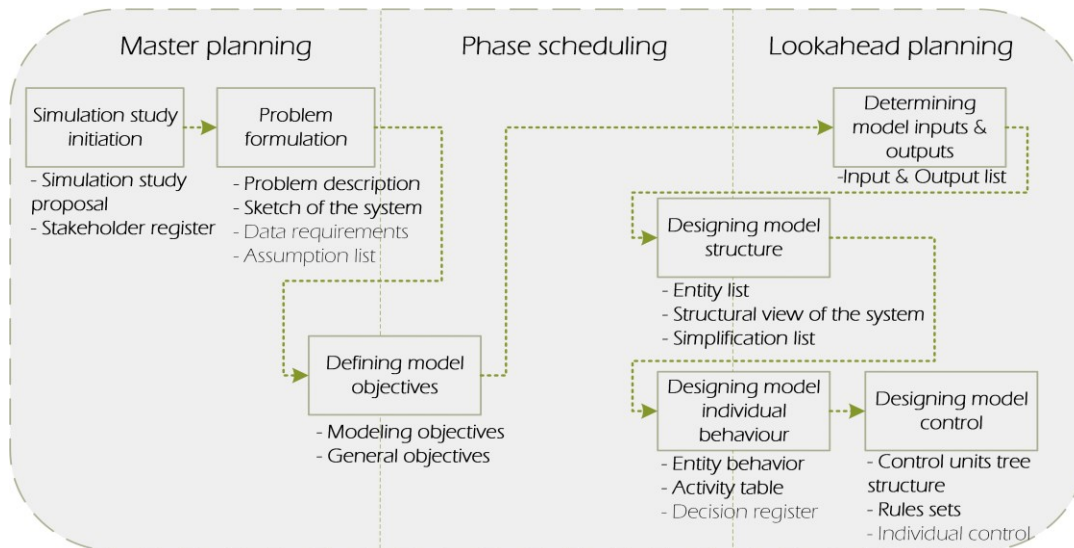


Figure 1: The integrated framework (CM documents in bold can be derived from the LPS).

4 CONCLUSION

This research proposes a methodology to integrate simulation CM with the LPS to leverage better adoption of simulation in construction. Extensive savings in modeling time and effort can be achieved by utilizing the practices of the LPS to build up a conceptual model. Moreover, this study proposes a novel method using simulation CM to support a practical implementation of the LPS. The framework is currently being validated in real construction projects to create the know-how for the end user. Future work includes testing the framework with subject matter experts to investigate the potential savings in modeling time and effort.

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