

ABSTRACT

Jen, Henry. Ph.D., Purdue University, May 2005. Web-based Construction Process Simulation Framework. Major Professor: Daniel W. Halpin.

Simulation is regarded as an effective analytic tool to analyze the performance of construction processes. However, the construction industry still has comparatively low usage of simulation when compared to other industries. This low usage is often due to the steep learning curve required when using simulation methodologies. The sometimes high acquisition cost of simulation tool and the on-going personnel training is also potential a barrier to its use. Encouraging more simulation usage in the construction industry is a challenging task. It is important to provide a simulation application that is easy to access, easy to understand, and supports easy reuse of the simulation models that are based upon previous efforts and expertise.

This research proposes a web-based construction process simulation framework in order to address above issues. This framework intends to provide an environment that the simulation is universally accessible through the web and provide user interfaces with different details that match the needs from the users with various level of sophistication. This framework also provides a centralized model library to store simulation models of various construction operations. Those stored models form a valuable database that helps in expedite the developing of new model and/or shorten the development time. WebCYLONE, a prototypical implementation of this framework, is designed based on the CYCLONE methodology in the research to demonstrate how this framework

operates.

Many construction processes such as the highway paving, high-rise building, bridge construction, and the tunneling are linear in nature. How the variability of activities impacts the performance in those operations is of interest to researchers. This research designs a genuine parade sequence model to evaluate this variability. It is found that the variability has negative performance impact even though the average productivity is the same among all activities in those linear operations.

The parade sequence model is also used to develop various level user interfaces of the simulation framework to demonstrate how this framework in general and WebCYCLONE in particular works.