ABSTRACT

Despite the critical importance of project completion timeliness, management practices in place today remain inadequate for addressing the persistent problem of project completion tardiness. A major culprit in late projects is uncertainty, which most, if not all, projects are inherently subject to (Goldratt 1997). This uncertainty resides in the estimates for activity durations, the occurrence of unplanned and unforeseen events, and the availability of critical resources.

In response to this problem, this research developed a comprehensive simulation based methodology for conducting quantitative project completion time risk analysis. It is called the Project Assessment by Simulation Technique (PAST). This new tool enables project stakeholders to visualize uncertainty or risk, i.e. the likelihood of their project completing late and the magnitude of the lateness, by providing them with a completion time distribution function of their projects.

Discrete event simulation is used within PAST to determine the completion distribution function for the project of interest. The simulation is populated with both deterministic and stochastic elements. The deterministic inputs include planned project activities, precedence requirements, and resource requirements. The stochastic inputs include activity duration growth distributions, probabilities for events that can impact the project, and other dynamic constraints that may be placed upon project activities and

milestones. These stochastic inputs are based upon past data from similar projects. The time for an entity to complete the simulation network, subject to both the deterministic and stochastic factors, represents the time to complete the project. Repeating the simulation hundreds or thousands of times allows one to create the project completion distribution function.

The Project Assessment by Simulation Technique was demonstrated to be effective for the on-going NASA project to assemble the International Space Station. Approximately $500 million per month is being spent on this project, which is scheduled to complete by 2010. NASA project stakeholders participated in determining and managing completion distribution functions produced from PAST. The first result was that project stakeholders improved project completion risk awareness. Secondly, using PAST, mitigation options were analyzed to improve project completion performance and reduce total project cost.