

Complexity As Culprit

Our long history and experience is that the failure rate for projects in general has remained high. Why haven't the advances in project management science, computers technology and communications been effectively brought to bear on the engineering and construction business? What about the advertised beneficial impact of 3-D computer-aided design, computerized critical path method schedules and building information modeling? Are today's engineers not as good as those who built the mega project of yesteryear like the Panama Canal, Empire State Building or Hoover Dam?

Owners, architects, engineers and contractors have been unable



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to deliver on-time, on-budget projects because of the complexity of capital projects and the inherent instability created by the contractual structure of the participants, which contain incentives/disincentives to proactively solve problems and seek to avoid blame.

In his book, "The Black Swan," Nassim Nicholas Taleb recounts in detail the "modern" statistical approach to determining the likelihood of an event. As he points out, we simply discount the rare and infrequent events because they may not happen in a normal lifetime. However, when they do occur, they disrupt the business environment in such a way that all of the underlying assumptions used to develop the project plan and execution strategy are revised and the reactions to and/or effects of the event are disproportionate and transient. Normalcy may not be quickly re-covered and the resulting secondary interactions of the event/events further confuse and distort matters.

Fundamental systems thinking calls for optimizing the overall system and its output and not the individual parts of the system. Optimizing doesn't necessarily require optimizing all components.

Initial Optimism

The project team's reaction may be determined in part by the context of the particular project and the perceived difficulty of achieving the goals of the original project. At the beginning they are optimistic and believe that best practices of project management will minimize the chance of failure. They model their construction projects in 3-D CAD systems and schedule activities in critical-path management schedules, creating an expectation of control and success that helps to "sell" the project.

But control of the project is tenuous at best and subject to independent action by contractors and other participants. Success isn't predictable or insured in the real world of complex, changing and sporadic interactions and competing priorities.

We don't believe it's good planning to utilize the most optimistic date for every work element of a three-year engineering and construction project and expect to improve on the delivery date and cost targets once the contracts are advertised for bid. A more rational

approach would be to use a Monte Carlo analysis to bound the time-frames expected for the major design and construction tasks and then produce a schedule of the most likely durations and completion dates given the most recent project histories for that environment. Incentive clauses could then be crafted to accelerate at reasonable cost the interim completion dates for sequential critical tasks.

Even with these cautions, Black Swan events might still frustrate and delay completion and add to project costs. What can you do? It's important to stay alert to the arrival of complexity by checking to see if established project management metrics are reliable and if "critical" activities are increasing in number on the CPM schedule or represent more than 50% of the activities. It's also important to note if CPM updates are overshadowed by events and outdated before issue, if increased staffing resources don't equate to additional completion gains and if small events trigger large impacts on multiple work activities. Confusing signals and conflicting direction from traditional management tools are another sign of trouble, as it is when the project team becomes increasingly frustrated. Project managers must implement trial-and-error approaches to search for solutions, and project teams must react with reflective, insightful leadership. In this way, understandings of complexity can be applied to reveal the root causes of impending project failure and to avoid them. ■

Robert C. McCue is a consulting engineer with forensic engineering consultant MDC Systems, Paoli, Pa. He can be reached at McCue@mdcsystems.com.

If you have an idea for a column, please contact Viewpoint Editor Richard Korman at richard_korman@mcgraw-hill.com.