NAC Executive Insights

Modeling and Mitigating Project Complexity

Whether the interest is megaprojects or more generally large projects, the consensus is that projects all too often fail. The reasons put forth vary depending on the project, but in general we can agree that they fail because outcomes do not match expectations. These outcomes may be cost, schedule, safety, quality, capacity, or some other measure of performance, but a failed project's outcome did not meet that expected—often due to complexity issues.

Reasons for failure may be attributed to issues of planning, organization, execution, unforeseen external influences, or simply unrealistic expectations, which themselves may be attributed to the aforementioned planning. When looking back at the number of failures, despite the research, technology advances, and other factors, one might conclude that it is a problem of complexity.

Whether at the task, function, or project level, complexity can impact project performance. It can be a function of project size, location, the number of stakeholders, or some other project attribute. The number of interfaces related to the number of stakeholders can contribute exponentially to complexity. For many large projects, remoteness of location, weather, and supply chain issues due to the project team's geographic dispersion add to team communication issues. Increasingly, regulatory and compliance issues impact performance.

For many of these reasons, project complexity has been the subject of considerable research. While many definitions exist, CII research defines project complexity as *"the degree of interrelatedness between project attributes, interfaces, and the consequential impact on predictability and functionality."* - CII RT 305 Research Team. (Thanks to Stu Anderson.)

Project complexity and its impacts can be mitigated with good front-end planning, risk assessment, execution, and leadership, but as characteristics of the project, they cannot be eliminated. Research in these areas is often organized by the project attribute being mitigated, and the research results aim to improve the quality of the information surrounding performance impacts of that attribute in a somewhat simplistic manner. A more comprehensive method of relating complexity factors to project outcomes is needed that is less dependent on the underlying assumptions of previous deterministic models, including multi-factor models.

Progress is being made in understanding project complexity and its mitigation through improved risk modeling. Use of stochastic simulation techniques for budgeting and scheduling not only provide more robust estimates, but also provide information conveying the likelihood of the outcome. Deterministic point estimates based upon historical and often simple, likely inputs encumbered by countless assumptions are being replaced by estimates produced through simulation modeling methods that are now available to virtually all project teams. Thus, for example, the likelihood and impact of a schedule delay due to weather and regulatory compliance can be more readily modeled for a more realistic basis while addressing much of the complexity due to the interrelatedness between these project attributes.

Complexity will always be a project characteristic, but by improved understanding of the interrelatedness between project attributes/complexity factors and their expected impact on project outcomes, project teams can better plan for and manage potential impacts.

About the Author

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