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The Nature of Risk in Complex Projects

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ABSTRACT

KEY WORDS
Complexity
Systems thinking
Risk
Project risk analysis
Mapping

Risk analysis for complex projects presents difficulties. Looking simply at the risks does not reveal the causal chains responsible for management actions, the motivations of project actors, the socio-political project complexities and intra-connectedness feedback. Common practice based upon decomposition-type methods is often shown to point to the wrong risks. The paper presents a complexity structure for identifying this "systemicity" and drawing lessons about key risks. It also shows how to analyze the systemic nature of risk, and how using risk maps can help the contractor and client understand the ramifications of their actions.

THE PROBLEM

The uncertainties facing "complex" projects are likely to be more interconnected, volatile and highly paced, or prone to socio-political risks whose effects are difficult to predict.

Business is becoming increasingly project-oriented, with many billions of dollars spent annually on projects around the world. However, the reputation of project management remains generally tepid, with projects being late, overspent and often technically unsuccessful. These threats increase with project complexity because the effects of risks within such projects are difficult to understand. The uncertainties facing "complex" projects are likely to be more interconnected, volatile and highly paced or prone to socio-political risks whose effects are difficult to predict.

Risks set up causal chains, often involving human motivational reactions to events and decision making by the primary project stakeholders. The problems are significantly exacerbated when these chains lead to positive feedback loops.

A conventional view of projects breaks them down into their constituent parts—in scope (work breakdown structure), time (critical path networks), cost (budgets), risk (risk registers) and so on. However, this is a truncated and wholly unsatisfactory perspective on complex projects.

The risks discussed in this article are known within the project and information systems literature, which already considers both residual risks and unintended consequences.

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The consideration of risk before a project starts and, particularly, the common practices related to project risk analysis, are woefully inadequate for analyzing risk in complex projects. Indeed, common practices can sometimes divert attention away from the key risks to less important ones.

THE STRUCTURE OF COMPLEXITY

(1) Technical complexity means a systems view of risk needs to be taken.

(2) The human reactions to events need to be accounted for in analyzing risk.

(3) The contracting parties' reactions to events need to be accounted for in analyzing risk.

(4) Detrimental positive feedback needs to be identified in analyzing risk.

The research is based on a five-dimensional model of complexity—structural, uncertainty, dynamics, pace and socio-political—published by Geraldi, Maylor and Williams in 2011.

Structural complexity implies multiple, interacting elements. Where uncertainty and dynamics exist in the system, risks will have causal chains of ramifications and will interact in multiple interconnecting ways.

When the system is further disrupted by pace, acceleration becomes both necessary and problematic because actions will interact with the causal chains of these ramifications. These causal chains can interact with ramifications from the socio-political complexity of the project environment, in particular, the reactions to events from the contracting parties.

An extra dimension of complexity comes where these causal chains combine into detrimental positive feedback. In this way, risks collectively become a serious overall risk.

Four important implications derive from the above discussion:

(1) The degree of technical complexity highlights the necessity for project managers to take a systems view of risk.

(2) An improved approach to analyzing risk in complex projects requires the project manager to:

2.1. Account for human reactions to events
2.2. Account for the contracting parties' reactions to events
2.3. Identify detrimental positive feedback

KEY RISKS IN COMPLEX PROJECTS

A main conclusion of this article is that prevailing methods to identify risk may not reveal the most critical risks in a project. Conventional risk analysis tends to identify risks with the greatest direct impact, and usually they are ranked as the most important, thus attracting the most attention from management.

However, in complex projects the ramifications of risks might be greater than the direct impacts. Examples of key risks in complex projects include:

1. ***The combination of risks and human reactions***
2. ***Pace and management actions***
3. ***Individuals within the parties***
4. ***Interpersonal relationships between the project parties***
5. ***Contracts between the project parties***
6. ***Culture within the project parties***
7. ***Changes to the project parties***

THE TOOL FOR DEALING WITH RISK IN COMPLEX SYSTEMS

A tool to look at risk with the features described above is a "risk map." Mapping project effects is a recognized part of systemic modeling work.

Initial mapping is often loose, dealing with rough concepts; to trace causality, however, this needs to be honed into a map of clearly defined variables. This should be at least a "Stage 2 Cause Map," working toward the "Stage 3 Influence Diagram" in which the project manager is

able to assign a "+" for a positive influence or a "–" for a negative influence—an essential part of identifying positive feedback.

The information on the map is valuable in various ways which include:

(1) The information contains knowledge of the systemicity.

(2) Use of mapping software can categorize the risks in various ways and show the "big picture" or detail.

(3) The map provides understanding, traceability of the information and the identification of synergistic risk-mitigation actions.

(4) The map can be used to identify prospective feedback loops and prompt questions on how to "break" such loops.

(5) The map can help in scenario analysis as the likely effects of outcomes are explored.

(6) The map can underpin project categorization.

(7) The map can also provide a foundation for quantification.

CONCLUSIONS

In complex projects, risks affect projects in combinations and structures of risks. Often the risks that cause project runaway are not individual, separate risks but, rather, combinations of risks in causal chains that, along with management actions and team reactions, build up "vicious circles" of disruption.

The effort to identify positive feedback loops in risk structures, and to assess how to "break" them, is a significant step in risk analysis.

Finally, a view of risk as a system rather than as individual entries on a risk register is necessary to properly understand the risk embedded in complex projects.

FULL CITATIONS

Geraldi, J., Maylor, H., & Williams, T. (2011). Now, let's make it really complex (complicated): A systematic review of the complexities of projects. *International Journal of Operations & Production Management, 31*(9), 966–990.

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