Project Management for a Complex Adaptive Operating System

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This article is based on the **Complex Adaptive Operating System: Creating Methods for Complex Project Management** case study (Findlay and Straus, 2015). The case study focuses on creating tools and methods that project managers can use in managing complex adaptive systems projects.

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Contents

Background

The International Centre for Complex Project Management (ICCPM) is a non-profit organization that was created to address "the international community's ability to successfully deliver very complex projects and manage complexity across all industry and government sectors" (ICCPM, 2012).

In an ongoing effort to help member organizations successfully undertake major complex projects, ICCPM conducted a bi-annual series of international round-tables. The purpose of the round-tables was to better understand what contributes to the success of complex projects and to identify and develop new and improved tools and approaches. The round-tables were facilitated using a computer-assisted collaborative meeting process that leverages the features of complex adaptive systems—described below—to help people with diverse viewpoints and experience create new collective understanding and plans for action.

Complex major projects are known for being unsuccessful in on-time and on-budget completion. A survey (IBM, 2008) of 1,500 change managers found that only 40% of projects finished on time and on budget. Barriers to success were the inability to change attitudes or mindsets (58%), dysfunctional culture (40%), lack of senior management support (32%), and underestimating the complexity of a project (35%).

However, several new systemic approaches show considerable promise as a way to think about and manage projects. Six frameworks help inform these approaches: systems thinking, the features of complex adaptive systems (CASs), complexity theory, the Complexity Model of Change (Findlay and Straus, 2011), polarity thinking as a way of thinking about and leveraging wicked problems, cognitive complexity, and adult development theory.

Systems thinking recognizes whole systems and the interdependencies of their parts. A system may be defined as "a set of things, organisms, and people that, as a result of their interconnection, produce their own patterns of behavior over time" (Meadows, 2008, p. 2). A system cannot be understood by focusing on its parts alone (Wheatley, 1999). To successfully address and influence a system, such as a complex project, one must understand the whole and how its parts interact.

Some project managers continue to think of a project as a "machine" that operates according to linear or algorithm rules. This persistent and largely unhelpful meme is now being displaced by a new and more robust model, which regards projects as complex adaptive systems (CASs). Unlike strictly mechanical systems, CASs are self-organizing, learn from experience, are emergent, and from time to time undergo large scale phase transitions to new and higher states of the system. This view of large-scale projects—which are heavily influenced by human interaction—is proving to be much more accurate and allows project managers to leverage techniques for exerting influence in environments that have previously presented intractable problems .

Leaders of complex projects would also be wise to consider three fundamental theorems of complexity theory, which apply to CASs and which are critical to project success. These are a robust model of the system, requisite variety and adopting solutions which act at an appropriate scale.

- The robust model axiom considers that “no one can effectively influence a system until they have a thorough understanding of its scope and the connections and interdependencies” (Conant and Ashby, 1970).
- The law of requisite variety contends that “complexity can only be dealt with by equal or greater complexity” (Ashby, 1956, p. 2). In other words, in order to deal effectively with the diversity of problems presented by a complex project, one must have a repertoire of responses which is (at least) as nuanced as the problems themselves (Requisite Variety, 2015).
- The scale condition requires that those who wish to exercise leverage over a system must recognize that “highly complex situations can best be addressed by greater degrees of freedom at the local scale so that innovation and adaptability are maximized” (Bar-Yam, 2004).

A third framework, the Complexity Model of Change, is a model of socio-technological change, comprising a series of growth and decay curves or waves, which helps project managers better understand how to influence systems and design new ones, so the roles, methods, rules of interaction or engagement, technologies, and relationships between people are better aligned with each other and the desired outcome. The overlapping waves represent large-scale eras, for example, the Industrial Age and the Information Age, which have at their core a metaphor, for example, the machine and the computer. The current wave, the Knowledge Age, is based on a network metaphor. The wave we are now entering is the Wisdom Age, which began in 2010. Its core metaphor is the complex adaptive system and the main thrust of this period is the wise application of knowledge.

Another area that project managers may now address differently is that of wicked problems or paradoxes: problems that are ill-defined and recurrent, and which, when attempts are made to solve them with single optimal solutions, create another problem. Polarity thinking regards wicked problems as sets of interdependent values or ideas—like centralizing for efficiency and decentralizing for adaptability—that persist together over time and need each other for the success of the system. If we pay attention to one pole at the expense of the other, we achieve sub-optimal results. When we manage polarities as a system, we realize the benefits of both poles and achieve high performance over time with a minimum of vacillation and the need for correction.

Other disciplines that are critical to project success are understanding and making best use of new ways of thinking about issues and relating to others in more flexible and adaptive ways. Theories of cognitive complexity and adult development theory can contribute to how we think about this problem. For example, "triple-loop learning" (Gragert, 2013), helps us think about issues from a higher level of cognitive complexity. Instead of asking "Are we doing things right (single loop)?", we might ask, "Are we doing the right things (double loop)?" or "How do we decide what is the most effective paradigm to use to influence and create benefit for the system (triple)?"

Purpose

The purpose of the ICCPM roundtables was to help project managers develop new and better ways to lead complex major projects, by bringing together people from both the buy-side and the supply-side to share their knowledge and experience and to grow a network of practitioners, professionals, researchers, and educators able to deliver leading edge complex project management solutions to client organizations and partners around the world (Findlay and Straus, 2015, p. 489).

Challenges

There are many challenges to be addressed in the complex project management environments. The three top contenders are 1) developing new ways of thinking, acting, and interacting; 2) developing more robust models of the system by getting everyone in the room—the project management team and their stakeholders; and 3) steering projects through multiple disruptive socio-technological shifts using the feature of complex adaptive systems.

> “People, their organizations, and their projects need to be capable of reorganizing into new forms, which are a better fit with the new context” (Findlay and Straus, 2015, p. 494).

Systems Engineering Practices

One of the tools Findlay and Straus use to deal with all three challenges in the context of group interaction, such as the ICCPM round-tables, is the Zing complex adaptive meeting process. The process is used to guide conversation in the room, to capture, simultaneously display ideas and to help participants integrate and make meaning from the ideas. The tool was used for the round-tables to help people work together in new ways, develop new and better models of the system together and to design and pilot new and better decision and learning methods.

The technology “provide[s] a container for a suitably representative sample of the people in the system to meet and conceptualize a robust model of the system and develop strategies for how to leverage the system” (Findlay and Straus, 2015, p. 492).

A “talk-type-read-review” (Findlay and Straus, 2015, p. 492) etiquette was employed to organize the session, which, in complexity theory terms, is a simple rule of interaction. Rich, open-ended questions guide the conversations, the ideas are read out loud and the common themes or stand out ideas are recorded by the facilitators.

The open-ended questions are asked one at a time to explore all possibilities and reduce complexity. Although, round-table participants often held opposing views at the beginning of the session, through a processes of continual, iterative feedback, they ultimately arrived at similar or complementary conclusions by the end of the round-table.

The process “automates”—or helps participants engage in—ways of interacting that incorporate a higher level of cognitive complexity than the participants might engage in individually, thus facilitating a shift in the group to a higher level of system performance.

Lessons Learned

The role of leaders of complex projects is to help their organization systems successfully deliver on time and on budget amidst constant change. Their mandate is to deliver amazing new solutions while making few or no mistakes—a challenging goal even in far less complex environments. In order to be successful, project leaders (and their teams) need new systems structures—new tools and methods—that reliably get better results. They need to have a robust and fresh understanding of the systems over which they preside and how they might influence them to greatest effect.

No longer can the complex project leader go off into a corner and design a project and then try to sell it to the community and political leaders, for example. Leaders now need to involve the whole system in the design of a project from its inception through to completion. They need to deal with wicked problems not by looking for the one best solution, but by integrating and leveraging competing ideas. This requires a shift in perspective: from attempting to “control” a complex project system as one might control a mechanical device, to understanding projects as highly complex and interconnected “living” systems that evolve over time. While we do not have “control” over our systems in the classical sense, we can exert influence very effectively, provided that we constantly update our understanding of what is going on and learn new ways to act and interact that are more likely to achieve our desired outcomes.

To achieve this, leaders need to develop the capacity to “anticipate the skills, leadership and coordination roles, technologies, methods, and processes that will be required to successfully surf the waves of change…” (Findlay and Straus, 2015, p. 501).

The 2012 ICCPM round-table series discussion paper (ICCPM, 2012) uses the example of a system undergoing transformation of many levels to illustrate the difficulty that complex project leaders face:

> “The issue has been characterized as learning to fly a plane, while the plane is already in the air, and being re-assembled into another kind of transportation

> technology altogether. And, at the same time, the current passengers are disembarking and another group is boarding that demands a better quality of service or experience at lower cost than ever before. (ICCPM 2015 p. 21)”

This case study illustrates the need, in times of accelerating change, of “a real-time, systems-wide approach to the development of the methods and tools for managing complex projects” (Findlay and Straus, 2015, p. 500) so leaders can deal successfully and creatively with uncertainty and ambiguity.

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Additional References

None.

< Previous Article | Parent Article | Next Article>
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