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New Strategies *for* Managing Complex Projects

by Donna Robbins

The sciences of biology and physics provide clues for successfully managing projects in today's environment.

PROJECTS TODAY DON'T always look like they did in the past. Project managers work in an environment of reduced resources, intense speed, and constant change. They're expected to make decisions faster, with less data. In the past, they could rely on their technical expertise and experience to make good decisions. But today's projects are different; they often involve such intricate stakeholder interdependencies that no one person can know them all. The project manager faced with this overwhelming degree of interconnections is probably working in a complex system where expertise and experience may not be enough.

Consider, for example, a newly contracted project in aerospace, where the project life cycle includes design, development, test, manufacturing, and support. There are two major customers and

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two key suppliers. In each technical function, the work must be integrated with the work of each of the other functions. In this example, the five life cycle functions plus project management means that 15 interconnections must be "managed." There are the interconnections between the contracted project and its customers and suppliers. With two customers and two suppliers, we have 10 additional interdependencies. Finally, consider the relationships between each of the functional life cycle areas and the customer and supplier groups—another 10 interconnections. The project manager is not only managing 2,000 or so lines of tasks, but he or she is also doing the work in a system that includes at least 45 interdependencies that also need to be managed. This project manager is certainly working in a complex system.

Much of our knowledge about complex systems comes to us from quantum physics and biology. Let's explore three principles of complex systems and their implications for managing complex projects: There is No Meaning In Isolation; Complex Systems Evolve From Simple Rules; To Understand a Complex System, Study the Complexity.

There Is No Meaning in Isolation. Only when parts of a system interact with other parts of that system—when they communicate directly with each other—do meaningful patterns emerge. This principle has direct application when we try to make sense of complexity such as that in our project management example.

In a natural system, all parts have access to other parts of the system, and the entire system is jointly responsible for integrating its work. But we typically do not provide this access when managing a project. Instead, the project manager meets with each subgroup and carries messages back and forth between the groups. Or perhaps the enlightened project manager has established a leadership team with representatives from all of the technical disciplines. But as our understanding of complex systems increases we realize that what is needed is a change in our expectation that an individual or group of individuals christened as leaders can successfully play the role of integrator. Managing a complex system requires all parts of the system to have access to all other parts so that everyone in the system is responsible for integration.

In our work, the principle of "no meaning in isolation" has led us to encourage project managers to gather representatives from all stakeholder groups and have them present their unique perspectives to each other. In this way individuals see how their work is connected and how it affects the work of others on the project. Those who participate in the sessions create meaning, and the elusive answers seem to emerge.

A phenomenon occurs when knowledgeable, involved people come together and think together. They create a kind of collective knowing.

Successfully managing a complex project means putting an end to a single individual—or small group of individuals—managing behind closed doors. Project management must bring together all stakeholders for conversations in which the complex maze of interdependencies becomes visible to everyone. And how to manage the work becomes apparent to everyone.

In the words of Dee Hock, chairman and founder of VISA, managers must "be ready to share ownership … very widely among participants. They need to understand that any system worth building in this global century is going to be too complex for any individual or small group to understand, let alone to manage." (See sidebar for reference sources and suggested reading.)

Complex Systems Evolve From Simple Rules. I was standing on a street corner, waiting for a bus, when I looked down and saw a blob of ice cream on the pavement. About 30 seconds later I looked again and saw that a couple ants had found the ice cream. Within the next two minutes, an army of ants arrived and carried off all the ice cream—the pavement was clean. These ants had sent out scouts, located the food source, deployed personnel, accommodated for the slippery consistency of the food, and—I assume—achieved their goal of bringing food back to the nest quickly and successfully, with no visible conflict.

Biologists have determined that in natural settings highly complex behavior is governed by simple rules. Try to imagine the simple rules that govern the complex behavior of birds in flight formation:

- Keep pace with the other birds.
- Try to stay close to the center of the flock.
- Maintain minimum separation from the nearest bird.

In another example, a single wolf cannot bring down a full-grown moose. But three of them can if two of them distract the moose while one leaps onto the moose's back. What simple rules could enable wolves to coordinate such complex behavior? How about these:

- Move as close to the moose as possible.
- Stay as far from each other as possible.

The implication of these findings suggest we must stop creating "rules" or processes and procedures that are so complex as to confound the ability of the system to locate, let alone achieve, its goals. The goal of the birds is simple and clear: maintain the formation. The goal of the wolves is clear: get food. In managing our complex systems, we must resist the urge to tighten the reins and make more rules. Instead, we should reduce the number of rules and increase the clarity of the goal.

To Understand a Complex System, Study the Complexity. The work of a complex system is so highly integrated that, to understand how it works, we must observe it in its complexity. When we try to simplify, we no longer see the reality of the system, and we lose the ability to understand how the system really works. The typical way to understand a project is to break it into subprocesses and examine each piece separately. So, we divide work into its functional parts: development, production, test, and so forth, and ensure that the work of each discrete part gets done. This method has been so ingrained that we don't even think about alternatives. But experience reveals that each function can do its work on time and within budget, and yet the outcome may still not be successful.

Suggested Reading

Interested in learning more about the concept expressed in this article? Here are some helpful references:

Hock, Dee W. *Birth of the Chaordic Age*, 1999, Berrett-Koehler Pub.

Parunak, H. Van Dyke, "Termites, Taxicabs, and Manufacturing Systems," paper presented at the 4th Annual Chaos in Manufacturing Conference, Santa Fe, N.M., USA, 1996, Industrial Technology Institute, Ann Arbor, Mich.

Wheatley, Margaret J. *Leadership and the New Science: Discovering Order in a Chaotic World*, 2001, Berrett-Koehler Pub.

Wheatley, Margaret J., and Myron Kellner-Rogers. *A Simpler Way*, 1998, Berrett-Koehler Pub.

Wolf, Fred Alan. *Taking the Quantum Leap: The New Physics for Nonscientists*, 1988, HarperCollins.

The most serious problems usually show up in the in-between places—those places that require integration of work. If we liken a complex project to a symphony, we quickly recognize that we cannot hear a symphony by listening to each instrument separately; it makes no sense. Only when the orchestra plays together do we hear a symphony.

To make sense of complexity in large projects, players from all stakeholder groups must come together to share their view of the work and learn how each part fits with all the other parts. A phenomenon occurs when knowledgeable, involved people come together and think together. They create a kind of collective knowing. Out of the density of information come important, illuminating connections about how work needs to be done. This phenomenon does not happen when we break the work into pieces and work each piece separately. It happens only when we allow the complexity to show itself and by our willingness to hang out with the discomfort that comes from not immediately knowing.

IT MAY BE EASY to accept these principles as they apply to natural systems, but not so easy to accept their value for business systems. But in those moments when no one is around and we are honest with ourselves, we know that we cannot deal with the speed of change in business by behaving in conventional ways. We know that we cannot keep up with the immense amount of new information, and we question our ability to make good decisions. Suppose we did look to natural systems for guidance. Suppose the complexity inherent in natural systems could suggest answers for the complexity inherent in our work systems. Then, we might consider these three principles of complex systems not as a lapse of sanity but as a leap of courage. ■

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