Managing the Unknown

Part I of this book gave an overview of established PRM and showed the limitations of this approach when unforeseeable uncertainty—or unk unks—is present. In order to understand the nature of the limitations, we begin by observing that the standard PRM approach rests on a fundamental assumption—namely, that we are operating essentially on *known terrain*, where it is known, in principle, what events and outcomes of actions to expect, and with *moderate complexity*, where the nature of the "solution space" is roughly known, where an action does not cause entirely unexpected effects in different parts of the project, and where we can choose a best course of action. In other words, we know the *range* of things that can happen and their causes, even if we may not be able to predict with certainty which of the identified events will happen or to what degree of probability they are likely to occur.

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Neither projects that contain significant novelty nor complex projects of long duration fulfill this assumption. Let us come back to the mountaineering metaphor from the introduction to Part I of the book. This time, you are planning an expedition to an unknown mountain in the Hindu Kush in northern Afghanistan. No one has been there; there are no maps and no weather forecasts because there are no meteorological stations close by. Mastering the unknown mountain requires more sophisticated mountaineering skills, as well as more experienced and flexible people who can observe the terrain and the weather during the expedition and who can make decisions in response to what they learn. Committing to any plan, no matter how sophisticated, will lead to trouble if the team is not ready to substantially deviate from it if necessary. The team may even decide that the originally targeted mountain is too difficult in the given weather conditions and switch to an adjacent lower peak (learning). Or the team may prepare two alternative routes in parallel and keep both of them "alive" until the final approach of the summit (selectionism).

The mountaineering example is representative of projects that are novel in terms of the technology employed and/or the markets pursued, and projects of long duration. These are commonly plagued by fundamentally unforeseeable events and/or unknown interactions among different actions and project parts.[1] A "straight" application of PRM, without recognizing the additional novelty challenge, is insufficient and may have destructive effects, as we saw in Chapter 2. In Chapter 3, we have discussed the fundamental sources of uncertainty, and we have proposed an extension of PRM, including control-and-fast-response, project contracts, and, in particular, the two fundamental approaches of responding to unk unks, namely, trial-and-error learning and selectionism.

We are, of course, not the first to observe that project management and PRM must be adjusted to the presence of uncertainty and complexity. "Contingent approaches in project management" became a major theme in the second half of the 1990s. For example, in 1999, Terry Williams stated, "Projects are becoming increasingly complex; traditional project management methods are proving inadequate, and new methods of analysis and management are needed."[2] Empirical studies have shown that complexity and uncertainty lead to budget and schedule overruns and to high costs of the system developed.[3]

Miller and Lessard, in their study of large engineering projects, concluded, "The assumption that large engineering projects can be scoped, planned and managed with existing planning techniques cannot prevent problems, which are then seen as managerial failures. Prior empirical studies . . . have focused on technical and

economic factors, but few suggested that the model of pre-specified rational planning is increasingly in trouble."[4]

Aaron Shenhar and his coworkers[5] identified "system scope" (and thus complexity) and uncertainty as major drivers of project management approaches: Complex projects require stringent planning and control, even bureaucracy. Highly uncertain projects require flexibility, testing, and intensive communication [we would call this "learning"]. Projects that exhibit both uncertainty and complexity need systems engineering, integration, and risk management. We build on this work in the context of PRM, by proposing operational principles and methods of management.

It is now the mission of Part II of this book to explain how these approaches to managing unforeseen uncertainty and complexity work in practice. The first question we have to answer is this: If unk unks are "unforeseeable," how can we prepare for them? Isn't that a contradiction, preparing for something that is unforeseeable? Chapter 4 addresses this question. It demonstrates the *diagnosis* of the types of uncertainty and complexity at the outset of the project. Yes, unk unks are fundamentally unforeseeable, but their *presence* can be predicted by diagnosing gaps in the team's knowledge about the project. Any important gap means that unk unks lurk (although the team can't know what they are). A systematic diagnosis of uncertainty and complexity is shown in the example of Escend, a startup company that tackled a novel market.

Chapters 5 and 6 then illustrate what trial-and-error learning and selectionism look like in real projects. Chapter 5 presents a project that used the learning approach (the startup company, Escend, from Chapter 4), and Chapter 6 presents a project with selectionism (another startup company that developed a new technology).

The question then arises: If we have two approaches to managing unk unks, how do we choose between them? Which one should be used when? Chapter 7 explains the trade-offs between them, on the cost side—How much does it cost to perform parallel selectionist trials versus experimenting and learning—and on the value side—How good might the solutions be that each approach produces? We also emphasize that in many cases, this is not an either/or question, but both approaches together provide a powerful combination of responding to unforeseeable uncertainty. Chapter 7 offers a decision framework for deciding when to use which approach and when to combine them, and we illustrate the framework on the Circored example from Chapter 2.

Endnotes

1. See, for example, Morris and Hugh 1987, Schrader et al. 1993, Hamel and Prahalad 1994, Miller and Lessard 2000, or Pich et al. 2002.
2. Williams 1999, p. 269.
3. For example, in the context of product development projects, see Tatikonda and Rosenthal 2000. For large engineering projects, see Miller and Lessard 2000. See also Morris and Hough's (1987) classic study of large projects, which also found that uncertainty and complexity cause problems.
4. Miller and Lessard 2000, p. 4.
5. See, for example, Shenhar 1998 and 2001, Shenhar and Dvir 1996, Dvir et al. 1998.