

Chapter XVIII

Technical Risk Management

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ABSTRACT

In today's highly competitive industrial environment, many high-tech businesses are using Technical Risk Management (TRM) in their engineering design programs as a means of improving the chances of success. TRM allows program managers to pinpoint potential failure modes of a project early in the process, so that corrective actions can be taken in the most effective manner. TRM also allows managers to appropriately prioritize program tasks so as to achieve optimum use of available technical resources. TRM requires that a methodology of practices and processes be implemented on an ongoing basis. These processes identify, evaluate, mitigate, and manage technical risks affecting program success. This chapter will discuss implementation of the TRM process and provide a simple example to show how the process works.

INTRODUCTION

Technical Risk Management (TRM) is a process by which the technical risks that can negatively impact program success are identified, ranked, and addressed so as to decrease the chances of project failure. Recently, many high-tech industries have included TRM as a part of their new technology

programs. Modarres (2006) notes, "engineering systems are becoming more complex and demand for risk analysis is greater than ever." (p. 3) He continues, "recently, many legislators including U.S. Congress have advocated greater reliance on the use of risk information." (p. 3) The United States Department of Defense has instituted a requirement that risk management procedures

be defined at the proposal stage for many new programs and that any major technical reviews include a status update on the management of all identified risks. Even where TRM is not required by contract, many businesses are implementing their own internal requirements for a technical risk management process to be in place.

A TRM process forces the design team into critical problem solving mode early in the program, thus avoiding last minute panics. It also facilitates the most intelligent ordering of task priorities and the most efficient allocation of available resources. For these reasons it is becoming popular with program managers as a means of reducing the risk of program failure and simultaneously helping them manage their programs with the leanest possible staffing resources.

BACKGROUND

A recent risk analysis survey, conducted in the aerospace industry, stated, "Increasingly, Government customers and Industry contractors seek better methods to identify and manage technical, schedule, and cost risk." (Black, 2001, p. 1) The survey documented that 39% of industry representatives surveyed expect their technical staff to play the major role in risk management, whereas 33% placed responsibility for risk management on the cost estimators, 14% on management and 14% elsewhere. Clearly the technical staff in aerospace firms is expected to participate heavily in the management of technical risks. The medical device industry is another industry with this expectation. Kaye and Crowley (2000) have described the use of TRM in that industry, saying "Risk Management is a systematic application of policies, procedures, and practices to the analysis, evaluation, and mitigation of risks. It is a key component of quality management systems, and is a central requirement of the implementation of design controls in the Quality Systems Regulation." (p. 8) Software development engineering is

yet another arena where the importance of managing risk has been recognized. Kendall (2007) has stated that at least 25% of software design projects are cancelled before completion and 89% overrun budget. Based on this, the report goes on to say "It is no surprise, then, that one of the drivers in the evolution of software engineering, as a discipline, has been the desire to identify reliable, quantifiable ways to manage software development risks." (p. 1)

For U.S. Department of Defense programs, guidelines for estimating the probability of occurrence and the magnitude of failure impact are published as part of military standard MIL-STD-882, System Safety Program Requirements, which states "A formal safety program that stresses early hazard identification and elimination or reduction of associated risk to a level acceptable to the managing activity is the principle contribution to effective system safety." (U.S. DoD, 1984, p. 2) The TRM concept is required for virtually all new military contracts. Plans are frequently subject to monthly tracking by program-wide risk review boards comprised of members of the technical staff of both the vendor and the contracting agency. Additional government agencies are adopting this practice and many commercial customers contracting for new designs in high-tech industries are instituting internal requirements for TRM to be part of every program.

Branscomb (2000) described the impact of a failure to effectively manage technical risk, in the forward to a government sponsored paper entitled *Managing Technical Risk*, when he said "The risks associated with science based commercial innovations are real and often hard to quantify and circumscribe. These risks contribute to business failures, but more importantly to underinvestment in the early stages of research and to opportunities foregone." (p. 2) Today's new engineering and technology college graduates would benefit from inclusion of TRM concepts into the curriculum. In fact, a national survey of faculty involved in collegiate engineering and technology capstone

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