Chapter 6
Project Management Risk

ABSTRACT

Presented method is applied to Project Management by using PERT-CPM critical paths to manage project risk. DMAIC framework applies stochastic techniques. Stochastic optimisation determines the critical paths. Every critical path is simulated and associated risks are calculated. Six Sigma process metrics are calculated against specified targets. Simulation results are analysed and sensitivity analysis is used to identify and quantify the main contributors to the variability of the project duration time. The critical paths are ranked and prioritised for management's attention based on their associated risk factors. The project was not implemented, so there no data for analysis. However, assuming that the project was implemented, a generic Project Control phase is applied.

INTRODUCTION

This chapter presents the Project Management application class of the method. It is applied in a PERT-CPM Project Management scenario to manage the risk of a project to build a power plant.

A project is a combination of activities that must be finished in a certain sequence in order for the project to be completed. The activities are interrelated in a logical order so that some activities cannot start before some others are completed. A project activity is a task that requires resources and time to be accomplished. In the past, the project planning used Gantt charts to define the start and finish of all the activities in a horizontal time scale.

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Project management has evolved into a structured and efficient methodology as a result of the development of Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT) in 1956–1958. CPM and PERT provided for an analytic approach to project planning, scheduling and control and were subsequently combined into one method, PERT–CPM.

Project management using PERT–CPM has three stages (Taha 1987, Chapter 12):

1. **Planning:** Determine all project activities and estimate associated time for completion. Define also all activity interrelations and create the project network diagram.
2. **Scheduling:** Determine the critical paths of the project, i.e. those activities that will delay the entire project if they are delayed. For the activities, which are not part of the critical paths, define the amount of slack or float times that can be used when non-critical activities are delayed, or when limited resources need to be efficiently used.
3. **Control:** Regularly analyse and report project progress by using the project network diagram and associated time lines. If required, update the network diagram reanalyse, and define a new schedule for the unfinished part of the project.

The PERT–CPM method is presented at an introductory level in Baker, Eris and Irwin (1964). A comprehensive coverage of using the PERT–CPM method for project management, including planning and control can be found in Punmia and Khandelwal (2002). The PERT–CPM method is also discussed in Sharma (2006).

Project management and risk are the subject of many scholars published works. For example, Burke (1999) published an effective project management fact-based book presenting many aspects and issues that are based on the author's practical experience in the field. The project management techniques are introduced by practical examples that help with understanding the empirical application of these techniques.

Akintoye and MacLeod (1997) discuss risk analysis and management in the construction industry, based on a survey of the industry's general contractors' project management. The questionnaire was about the industry's perception of risk associated with its activities and the extent to which the industry uses risk analysis and management techniques. The conclusion was that risk management is essential to construction activities in minimising losses and