

# Chapter 4

## Managing an Engineering Project

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### **ABSTRACT**

*This chapter provides an overview of the comprehensive process in creating a “Project Plan” for an engineering project. The authors discuss the challenges of project management tasks, tools, and methods used. They also discuss and compare other commonly used project planning practices and techniques. This chapter includes authors’ experiences drawn from their careers and industries that are applicable to projects of this nature. They propose methodical approaches to handle a large, and complex engineering and construction project that takes several years to complete. The project selected is a hypothetical biomass engineering plant considered for this examination.*

### **1. INTRODUCTION**

A project is defined as “A temporary endeavor undertaken to create a unique product, service, or result” (Meredith & Mantel Jr., 2011), and project management is defined as “application of knowledge, skills, tools, and techniques to project activities to meet project requirements” (Schwalbe, 2013). We learn that Project Management, although under-recognized as a key element in the rise of civilization as we know it, has been practiced for thousands of years, since and possibly, before the Egyptian Era (Carayannis et al., 2005). Some of the earliest projects ever managed in human history were developed by the Egyptians (Meredith & Mantel Jr., 2011). Project management started getting recognition in the 1940’s during the Manhattan project. It was observed that different government entities, as well as engineering firms, started applying project management practices systematically to attempt to control costs and ensure delivery due dates.

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As observed in the history of project management, it is possible to see the important role project management plays in developing new technologies as well. Biomass power plants are difficult engineering challenges, large in size, complex, and technically challenging. This is because they are part of a new trend towards developing environmentally sustainable (Rahman and Akhter, 2010) and energy efficient power production facilities.

We discuss the project implementation of a biomass power plant; the purpose of which is to provide a heat source for the company's wood drying kilns, as well as potentially shared with the community hospital and homes. The source of the biomass are the cast off byproducts of the milling processes. We apply project management skills, tools, approaches and scheduling techniques to address the hypothetical project needs.

This chapter is divided into sections, each covering selection criteria for an engineering project such as this one. We start with a literature review to determine if there have been any previous projects that might have been implemented within the same field, and to learn more about the field of project management in general. We then review the different methods of data collection that we utilized and found suitable for this project, followed by an analysis section that presents leadership and decision making aspects of the project, in particular, and the fields, in general. We discuss the roles and responsibilities of the program manager, project manager (Kar & Mitra, 2015) and functional manager with respect to the project, as well as identify the project challenges with which we were faced and the subsequent solutions. Lastly, we will develop conclusions and recommendations based on our findings.

## **2. THEORETICAL FRAMEWORK AND LITERATUR REVIEW**

Over the last three decades project management endeavor has become mature. The Project Management Institute (PMI) was established in 1969 to advance project management from the field. On the other hand, academicians, researchers, and professionals have done a significant amount of research work in project management. These research works cover a wide-variety of areas that enriched this discipline and also have been helpful in undertaking large, complex, and challenging projects. For example, recent prominent projects include the Sydney Opera House in Australia, the Euro-Tunnel in Europe, the Tacoma Narrows Suspension Bridge in USA, Calcutta Metro in India, and Jamuna Multi-purpose Bridge in Bangladesh to name a few (Kharbanda & Pinto, 1996). These project implementations provide us stories of both success and failure, and lessons learned.

There are many challenges involved in a project's entire life cycle. Project Managers must work closely with relevant stakeholders to overcome challenges and get development work done on-time, to, a level of quality expected, and at an anticipated price. Project leaders have overall responsibility for the success of a project. In a business operations setting, the leadership needs to have the quality of global thinking (Daim et al. 2012). It is important to note, leaders are not made by mere title. Stevenson and Starkweather's (2010) research results show that "executives valued six critical core competencies: leadership, the ability to communicate at multiple levels, verbal and written skills, attitude and the ability to deal with ambiguity and change, as opposed to other competencies such as experience, work history, education, and technical expertise".

Lloyd-Walker and Walker propose an authentic leadership for 21st century project delivery (Lloyd-Walker & Walker, 2011). They suggest adopting a capability maturity model (CMM) template to measure maturity of authentic leadership. Besides project manager leadership skills, there needs to be clarity in

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