



What can we learn from the Hoover Dam project that influenced modern project management?

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Abstract

The Hoover Dam was completed two years ahead of schedule and under budget despite political, economical, technical, and organizational obstacles. Previous literature regarding the Hoover Dam project focused primarily on the aspects of design, engineering, and construction, with minimal analysis or discussions on project and program management techniques unique to this undertaking. This paper examines project and program management practices applied to the building of the Hoover Dam, and discusses how these factors contributed to the establishment and evolution of modern project management principles, tools, and techniques. A historical review of the Hoover Dam project reveals that the project team implemented a number of innovative strategies and practices that are comparable to critical success factors for today's megaprojects to overcome monumental project challenges and obstacles. This paper conveys the organizational and managerial best practices and presents lessons learned associated with the planning and construction of the Hoover Dam project.

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1. Introduction

1.1. Background

The Hoover Dam is one of the greatest engineering and construction projects of the 20th Century. President Hoover, a former mining engineer, promoted the dam as part of federal efforts to combat the Great Depression and tame the infertile West. Completed in 1936 as one of the largest infrastructure projects ever built in the United States, the Hoover Dam was completed two years ahead of schedule and under budget despite political, economical, technical, and organizational obstacles (Starr, 1993). The construction of the Hoover Dam is well documented however, the literature to date regarding the

Hoover Dam focuses primarily on the engineering aspects associated with design and construction, with minimal discussion on project and program management techniques, and how these factors contributed to the establishment and evolution of modern project management practices.

The history of the Hoover Dam from a project management's perspective is critical because it ushered in the framework of planning and managing government megaprojects, initiated innovative relationships between the government and various stakeholders, and introduced a host of social and managerial solutions (e.g., infrastructure and health management, project accounting strategies) for the workers and engineers that are nominal in today's project management practices (Flyvbjerg et al., 2003; Miller and Lessard, 2001; Morris and Hough, 1987). Modern projects and programs often utilize similar ingenuity and creativity deployed on the Hoover Dam without referencing or adequate consideration to their origins. Examining the organizational and managerial best practices and lessons learned associated with the planning and construction of the Hoover

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Dam will create common ground for academics and practitioners, and contribute to the project management body of knowledge.

This paper explores project and program management techniques unique to this undertaking, and how these factors contributed to the establishment and evolution of modern project management practices. The study examines economical, technical, organizational, and government obstacles, issues and challenges of the project along with its successful outcomes, followed by summarizing project management-related practices exercised by the project team for overcoming identified issues and challenges.

1.2. Research methodology

The primary research approach we employed was exploratory in nature by collecting reports, books, articles, and other related historical archives that captured various aspects of the Hoover Dam project. ABI/Inform, Civil Engineering Database, as well as national archives website were used to identify all relevant documents. Based on the collected materials, we were able to extract historical information that contains economical, political, managerial, and social aspects and environments related to the Hoover Dam. In fact, we were able to find many engineering and construction methods and techniques that were used for the project but, very little information related to project management principles or techniques were adopted. Due to the fact that the Hoover Dam project was completed more than 75 years ago and the documentation was scarce and limited, we acknowledge that the information that we used for this research is incomplete, however, content analysis was used to categorize historical information by project phase as well as document challenges and innovative management approaches that resulted in the successful completion of the Hoover Dam project. In the end, we document valuable insights and lessons learned that align with modern project management practices and principles.

2. History of the Hoover Dam project by project phases

2.1. Background

The Boulder Canyon Project, including the Imperial Dam, Hoover Dam, and the American Canal, commissioned by the Bureau of Reclamation, required 165 million dollars to finance, a total of 21,000 men and 4,400,000 cubic yards of concrete (Hoover, 2011). Initially used as a commerce route for transporting supplies to the Black Canyon area, the Colorado River was used for irrigation purposes that, despite the legislative difficulties in 1890s, was pursued by various land promotion companies and materialized by building a canal to irrigate part of the Imperial Valley in 1901. Operational problems of this canal, such as lack of an appropriate system for controlling the high flow of water in the river caused by torrential rains as well as the rapid rise of heavy silting disturbing the normal stream of the water in the canal, convinced the local and federal officials that there was an essential need for a stronger flood control program. In the Fall–Davis report of 1922, the Reclamation Service, which then was a part of the Interior Department,

brought the necessity of constructing a dam on the Colorado River to the attention of Congress and other interested parties. The report was accompanied by an abundance of technical information supporting the recommendations.

2.2. Conceptual phase

Preliminary designs were prepared from over a period of ten years, so the successive designs reflected some of the developments in design techniques during the 1920s. The recommendation made by the Reclamation Service was then followed by a course of action including the following (Dunar and McBride, 1993).

- Agreeing on the amount of water to be apportioned to the seven Basin states affected by the project included Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. The agreement signed by six of these seven states (Arizona signed in 1944) in November 1922 is known as the Colorado River Compact.
- Studying the eight candidates' locations initially proposed for the location of the dam with respect to the geological and topographical features of each alternative, water and silt storage capacity of the reservoir, location of the site in relation to a railroad, and the market for hydroelectric power. After eliminating six of the alternate locations and by further analysis of the remaining two candidates being Black Canyon and Boulder Canyon, the final location was determined to be in Black Canyon, the current location of the Hoover Dam. The Interior Secretary and Congress received the report favorably at the end of this stage.
- Specifying the reimbursement methodology the federal government would receive for funding the project. This became a key feature of the Hoover Dam's enabling legislation that created and executed contracts for the sale of the hydroelectric power generated over a fifty-year period at the rate determined by the Interior Secretary.
- Undertaking comprehensive preliminary engineering of the dam, including study of the various dam types and load analysis of the selected type by the Bureau of Reclamation (formerly Reclamation Service) with the help of University of Colorado in Boulder and under supervision of a board of consulting engineers that had been appointed by Congress in 1928 to monitor the design effort and approve the final design.
- Agreeing on dividing generated electricity equitably among competing bidders. After 7 months of study and analysis, the interior secretary decided to divide the proposed electricity generated at the dam between the Metropolitan Water District (36%), City of Los Angeles (13%), Southern California Edison Company (9%), and States of Nevada and Arizona (18% each). The total value of contracts was higher than \$327 million.

Finally, in December 1928 and after 4 years of study and review, the fourth version of the Boulder Canyon Project Act, which consisted of rough plans, cost estimates and two hundred pages of supportive information about the Hoover Dam, was

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