

The Evolution of Project Management

David I. Cleland

I. INTRODUCTION

THIS essay will provide a summary oversight of the evolution of Project Management.

Formal project management reinforced by supporting literature emerged in an unobtrusive manner in the late 1950s. Project management can be found in the creation and construction of many different historical artifacts and cultural improvements. In more recent times, project management gained special attention in the management of military weapons and supporting systems in the U.S. Department of Defense. The modern-day concepts and processes of project management can also be found in such large-scale *ad hoc* initiatives as the Manhattan Project, the Polaris submarine program, in large construction initiatives, and in the research and development community.

II. PROJECTS OF ANTIQUITY

Any review of how project management evolved must include a brief insight into how projects have played a key role in the initiation of change in the societies of antiquity. A few examples of such major projects include the following.

- *The Grand Canal of China*. This canal is the world's oldest and longest canal, far surpassing the next two canals of the world: the Suez and Panama Canals. The building of the Grand Canal of China began in 486 B.C. during the Wu Dynasty. It was extended during the Dynasty, and later by Emperor Yangdi of the Sui Dynasty. The canal is 1114 miles long with 24 locks and some 60 bridges.
- *Prince Henry the Navigator* (1394–1460). In the early years of the 15th century, Prince Henry the Navigator developed and operated what could be called today a research and development laboratory, located in Sagres, Portugal. The voyages of the discovery that he set forth could be considered "projects." These projects made important contributions to the evolving body of knowledge in cartography, navigation, and shipbuilding. Experiments in shipbuilding produced a new type of ship—the caravel, which made future exploration projects possible.
- *St. Petersburg, Russia*. In 1703, Peter began construction of a new city in the north, where the Neva River drains Lake Lladoga. The city was built on a myriad of islands, canals and swamps. Construction conditions were brutal. Nearly 100 000 workers perished in the first year. Within

ten years, St. Petersburg was a city of 35 000 buildings of granite and stone, and the capital of the Russian Empire.

In more recent times, other projects have played key roles in changing society such as the following.

- The Panama Canal was a vast, unprecedented feat of engineering, political, intrigue, and logistic challenge. Apart from Wars, it represented the largest, most costly single effort ever before mounted, and held the world's attention over a span of 40 years.
- In the U.S., in the 1860s, a project was initiated to join the continent of North America by railroad. The two biggest corporations in America, the Central Pacific, and the Union Pacific had armies of men at work building separate railroad lines. This project was an epic of logistics, organization and endurance. When the two railroads were joined in promotory Point, Utah, a single transportation system became operational from the East to the West Coast of the U.S.
- The Manhattan Project for the development delivery of the atomic bomb had a major impact on the strategy for the winning of World War II by the U.S. Leslie R. Groves was appointed as the Project Manager for the development, production, and delivery of the atomic bomb which, although devastating to Japan, is credited with saving the lives of thousands of American military personnel.
- The building of the Pennsylvania Turnpike in the late 1930s provided the opportunity to use an early process of project management. The Pennsylvania Turnpike opened on October 1, 1940, and was completed on time and within budget, and attained its objective as an innovative means for improving highway systems.
- The creation and formation of the Internet was not a monolithic project. Rather it was a patchwork of individual and organizational contributions combined through many years. It was an immense integration of solitary effort and cooperative work. It came into being where knowledge and competency resided in thousands of uncelebrated places such as laboratories, classrooms, offices, social gatherings, and so forth, where people knowledgeable in computers and telephone lines got together and tried to improve communication among themselves.

III. EARLY INFLUENTIAL PUBLICATIONS

Probably, the first publication that described project management appeared in 1697, written by Daniel Defoe and titled, *An Essay on Projects*, is one of his earliest works. Many of his ideas are "projected" in the essay such as the registering of seamen;

Manuscript received July 1, 2004. Submission of this manuscript was invited by Editor-in-Chief, Dr. George F. Farris.

The author is with the School of Engineering, Department of Industrial Engineering, University of Pittsburgh, Pittsburgh, PA 15260 USA (e-mail: dic@engrng.pitt.edu).

Digital Object Identifier 10.1109/TEM.2004.836362

the education of women; provincial banks; state pensions; taxation; academies, etc. In several places, in this essay, direct references of projects are noted, one of which should appeal to today's members of the project management community:

And to Dedicate a Book of Projects to a Person who had never concern'd himself to Think that way, would be like Music to one that has no Ear.

(Daniel Defoe, *An Essay Upon Projects*, 1697, The Scholar Press Limited, Menston, England, 1969, p. ii).

Mary Parker Follett, writing in 1920, extolled the benefits of teams and participative management and said that leadership comes from ability rather than hierarchy. She advocated empowerment, drawing on the knowledge of workers, and supported the notion of the formation of teams through cross-functions in which a horizontal rather than a vertical authority would foster a freer exchange of knowledge within organizations.

An early article which caught the attention of the growing project management community was authored by Paul Gaddis, titled, "The Project Manager" and published in *The Harvard Business Review* in 1959, described the role of an individual in an advanced technology industry who functioned as a focal point for the management of resources being applied to manage ad hoc activities across organizational boundaries.

Another contribution to the emerging theory and practice of project management appeared in *The Harvard Business Review* in 1961, authored by Gerald Fish. He described the growing trend in contemporary organizations toward "functional-team-work" approaches in organizational design.

Professor John F. Mee, a noted scholar in the history of management theory and practice, published an article in *Business Horizons* in 1964, which described the characteristics of the Matrix Organization. He described one of the key characteristics of this approach as an organizational system which created a "web of relationships" rather than a line and staff relationship of work performance.

David I. Cleland and William R. King published *Systems Analysis and Project Management* (New York: McGraw-Hill, 1968). This book was the first scholarly book on project management cast in the context of the emerging "systems" approach in management theory and practice.

IV. GOVERNMENT CONTRIBUTIONS

In 1964, the U.S. Air Force announced a series of manuals and policies to enforce consistent management processes over the design and acquisition of weapons systems. The series changed the relationship between the government and private industry. The manuals and policies selected to effect management change was a series of Air Force systems Command Manuals, referred to as the 375 Series. The most important of these manuals were the following:

AFSCM 375-1 Configuration Management
 AFSCM 375-3 System Program Office Manual
 AFSCM 375-4 System Program Management
 AFSCM 375-5 System Engineering Management Procedures

AFSCM 375-6 Development Engineering

AFSCM 310-1 Management of Contractor Data and Reports.

In addition, other policy and procedure guidelines were published in the form of operating instructions, pamphlets, regulations, and other supporting documentation.

The impact of the 375 Series of Guidelines was to introduce changes in the Government-Defense Industry relationships. The impact that these guidelines had on the evolving project management literature was unbounded. Most of the early literature of the 1960s and 1970s drew on and reflected the philosophies, concepts, processes, and techniques put forth in the 375 Series. Today as the project management literature continues to emerge, one can see some of the early seeds of the 375 Series present.

This brief article will close on an enumeration of the major characteristics of projects that support organizational purposes.

V. CHARACTERISTICS OF PROJECTS

The characteristics include:

- created change—or reacted to change;
- results provide new or enhanced products, services, or organizational processes;
- involved varied degrees of risk and uncertainty;
- created benefits and/or destructive results;
- results ranged from modest to spectacular;
- created something that did not previously exist;
- results were integrated into the strategic or operational initiatives of the owner;
- social progress (or lack of progress) came about through projects.

VI. SUMMARY

Projects are to be found throughout the history of mankind. These projects have created change or have been carried out as responses to change. Project Management has had a major impact on the theory and practice of management.



David I. Cleland is Professor Emeritus at the School of Engineering, Department of Industrial Engineering, University of Pittsburgh, Pittsburgh, PA. He is the author/editor of 36 books in the field of project management, engineering management, and manufacturing management. An active member of the Project Management Institute (PMI), he has published numerous articles, handbook chapters, and presented many papers at professional meetings in his field. He has served as a consultant for both national and foreign companies, and is recognized as one of the best known members of PMI and described as the "Father of Project Management." He has both a national and international reputation in his field, and has been honored for his original and continuing contributions to his discipline.

Dr. Cleland is a third-time recipient of the "Distinguished Contribution to Project Management Award" from the PMI. In 1987, he was elected a Fellow of PMI. He was honored with the establishment of the "David I. Cleland Excellence in Project Management Literature Award" sponsored by the PMI in 1997.