

高等学校双语教学系列教材

# 工程项目管理

(英文版)

## Construction Project Management

[美] Frederick E. Gould 著  
Nancy E. Joyce



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# 出版说明

教育部于2001年出台了《关于加强高等学校本科教学工作提高教学质量的若干意见》，明确了高等学校要积极开展双语教学工作。目前各高校根据教育部的要求，陆续开设了双语教学课程。

为了配合建筑院校的双语教学，满足双语的教学需要，我社策划引进了这套《高等学校双语教学系列教材》。通过本系列教材的学习，可以使学生有效提高外语水平，了解和掌握学科专业及其前沿内容。该套丛书中，我们率先引进了《结构分析》(Structural Analysis)、《土木工程材料科学与技术》(The Science and Civil Engineering Materials)、《工程项目管理》(Construction Project Management)和《建设合同商务与法律原理》(Construction Contracting)四册，根据教学需求，我们将会陆续引进其他专业课程英语原版教材。为了更好地适应我国双语教学的专业特点，我们分别邀请了北京工业大学建筑工程学院的高向宇老师审阅了《结构分析》分册、李悦老师审阅了《土木工程材料科学与技术》分册、章慧蓉老师审阅了《工程项目管理》和《建设合同商务与法律原理》分册，他们对不符合我国建筑行业标准和教学内容的章节进行了删节，同时保持了原版教材的特点。

《结构分析》一书工程背景强，附有大量例题、习题和综合训练。《土木工程材料科学与技术》内容全面翔实、深入浅出、细节清晰。《工程项目管理》涵盖面广，包括了施工管理、招投标和合同法规等方面的内容。《建设合同商务与法律原理》侧重于商务和法律原理，理论性强，内容严谨系统，每章都有问题与训练。本套丛书可作为建筑院校本科生的双语专业教材使用。

本书为《高等学校双语教学系列教材》之《工程项目管理》分册，可供工程管理、土木工程专业双语教学使用，也可供相关专业师生、工作人员学习参考。

《高等学校双语教学系列教材》是我们进行双语教学教材工作的一种尝试，在引进和编辑过程中难免会有不足之处，敬请广大读者批评指正。

中国建筑工业出版社

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## CHAPTER OUTLINE

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INTRODUCTION  
TYPE OF INDUSTRY  
INDUSTRY SECTORS  
    Residential Sector  
    Commercial Building Sector  
    Infrastructure and Heavy Highway Sector  
    Industrial Sector  
RESEARCH AND DEVELOPMENT  
TRENDS IN THE INDUSTRY  
    Construction Ethics  
    Demographics  
    Opportunities  
CONCLUSION



## STUDENT LEARNING OBJECTIVES

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*In this chapter you will learn the following:*

1. The principle characteristics that define the construction industry
2. The four major sectors of construction projects
3. The nature of research and development within the construction industry
4. Current trends within the construction industry

## INTRODUCTION

“To form by assembling parts” is the dictionary definition for *construct*, but the phrase also is a metaphor for the construction process itself. Just as divergent materials come together to form a structure, so, too, does a diverse group of people come together to make the project possible. To bring together numerous independent businesses and corporate personalities into one goal oriented process is the peculiar challenge of the construction industry. The organizational cultures of architects, engineers, owners, builders, manufacturers, and suppliers may seem to work against the real need to forge a partnership that will ensure the success of a project. Yet, despite these very real challenges in the industry, construction projects do get completed. In fact, it is difficult to think of an industry that is more basic to our economy and to our daily lives. The highways we drive on, the bridges we cross, the water we drink, the fuel we burn: all are made possible by the activities of the construction industry. Like-



wise, where we shop, where we work, where we worship and learn, and where we live all exist because of the industry. Designers have visions; but until the contractor builds, those visions are just dreams on a sheet of paper.

Construction is also very intertwined with other aspects of our lives. It affects and is affected by developments in technology, computers, government policies, labor relations, and economic and political practices. Take, for instance, the technological leap of the skyscraper. Until the late 1800s, most buildings were four or five stories high. Masonry supported the structure from the ground. As the height of the building increased, the massing at the ground level also increased to support the additional load. Thus, if the building were built too high, the mass at the bottom would be too thick. Another limitation to height was that people could only practicably climb four or five stories. Because floors on the upper levels were difficult to rent, owners had no economic incentive to build any higher. But with the development of cheap methods of producing iron and steel and the invention of the elevator, architects began designing higher buildings. This spurred construction activity: landowners were motivated to develop these new buildings because the return on their investment was higher. Over time, as technological advances have allowed, the skyscraper has gotten taller. Figure 1.1 contrasts older and newer skyscrapers.

Innovations in robotics and computer modeling have also affected the construction industry. By using computers for modeling structures and imitating wind and seismic loads, architects and engineers can better anticipate nature's constraints and create better designs to counteract them. With robots directing equipment during construction, contractors can gain more control over processes that require precision for success, such as the construction of the underwater tunnel between France and England. The desire for such projects leads to the development of technologies to make them possible, which in turn encourages similar projects to go forward (see Figure 1.2).

## **TYPES OF INDUSTRY**

Construction is big business in the United States. According to the Bureau of Labor Statistics, the industry employs nearly 6 million people and represents 5 percent of the work force, making it the nation's largest single employer. The total value of construction in 2000 was \$815 billion, which represents 8.1 percent of the gross domestic product (GDP). Opportunities in construction have increased significantly in the last ten years. Construction employment in 2000 has risen by 49 percent since 1990. This is in contrast to employment as a whole, which has increased 21 percent. Although construction-related jobs are some of the best-paying in the country, they are often not a person's first career choice. Look at any construction company, and you will find people from a variety of backgrounds who, through experience and contin-



**Figure 1.1**

Technological innovation, if properly applied, allows projects to be built faster, bigger, and better.

*Source:* Photo by Margot Balboni, Geoscapes.

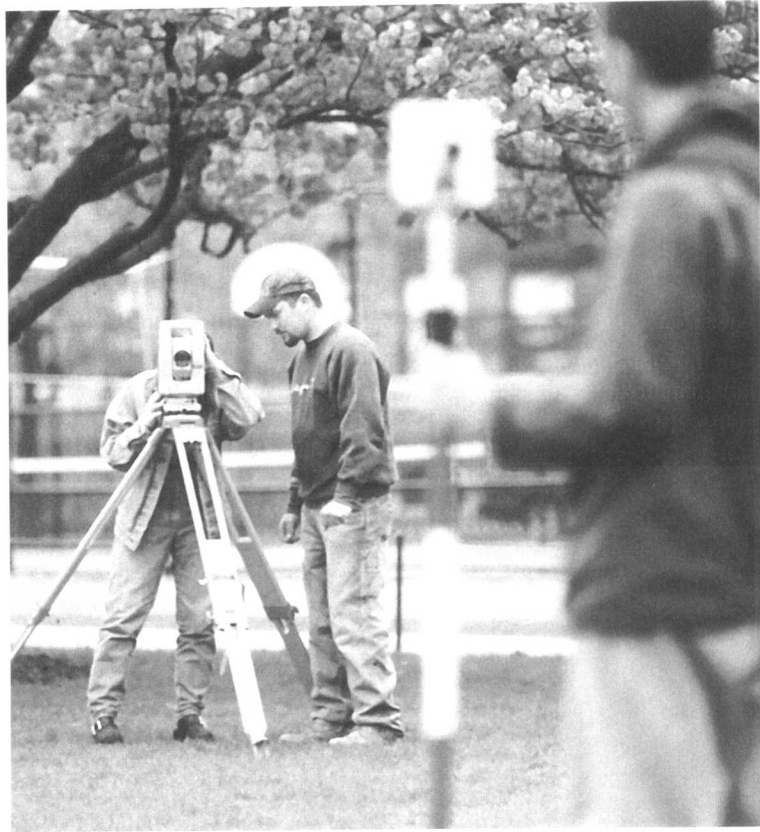
uing education, have been promoted through the ranks. This profile is starting to change, however, with the professionalization of the field and the introduction of undergraduate and graduate construction management programs at colleges and universities. Both the American Institute of Constructors (AIC) and the Construction Management Association of America (CMAA) have initiated professional certification programs.

Construction projects can be awe-inspiring in their breadth and complexity—from the Egyptian pyramids and Gothic cathedrals to soaring skyscrapers and enormous bridges. Yet the industry itself does not own these products, nor does it control their supply and demand. In fact, construction has relatively few assets compared with those of other industries. Its success or failure depends on the qualities of its people rather than on its technology or product. In this way, it is very much a service industry—one composed of many small businesses, especially in the residential and commercial building sectors. Construction does not require a patent or a large

**Figure 1.2**

The total station allows surveyors to collect, record, and transcribe surveying information with greater speed and accuracy.

*Source:* Photo by Amos Chau.  
Courtesy of the Wentworth Institute of Technology, Boston.



capital investment; anyone with motivation, technical skills, and a sufficient cash flow can start a business and be successful. However, because of the industry's cyclical nature, it inevitably has slow periods. Without capital to get them through these slow times, these small "mom and pop" businesses are at risk, and many are forced out of the market.

The risk factor is much higher in construction than it is in other industries because outside factors such as government funding, demographics, and market trends largely determine demand. Another reason for this high risk lies in the unpredictable nature of the work itself. Since construction takes place outside, it depends on weather conditions. Any extremes can affect productivity level, damage materials and work in place, create unsafe conditions, and even shut down the site entirely (see Figure 1.3). Moreover, the industry is custom-oriented, meaning that it is difficult to use mass-production techniques in either materials or methods. Each project has its own learning curve for both management and labor. Because all these factors