Changing Role of Engineers in Construction Management

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There has recently been a noticeable change in the environment within which engineers carry out their work—whether constructing highways, airports, buildings, or other facilities. A construction manager has traditionally been regarded as someone who has obtained basic knowledge and developed sufficient managerial and technical skills to achieve the successful completion of a project. To complete that same project today, however, requires compliance with a broad range of rules, regulations, laws, procedures, policies, guidelines, and specifications. The dictionary describes a manager as "a person who is trained in or skilled at directing or administering affairs or expenditures." Today's manager might better be described as "a person who plans, manages, improvises, and demonstrates by skillful acts and clever or ingenious tactics," or "a person who conducts or directs affairs and contrives to get along."

In the 1950s and 1960s, the focus of the engineering profession was on building infrastructure. Now, however, some areas of the country are increasingly concerned with preservation. Numerous activist groups scrutinize every move made by developers and governmental agencies. In addition, many agencies are being pressured to get projects completed more quickly. Government oversight agencies have expressed concern about the rising cost of projects, and fierce competition has made the construction industry more sensitive to time and money issues. Moreover, projects often run the risk of being carried out in a litigious atmosphere.

Construction managers are also under increasing pressure to consider the socioeconomic impacts of technical decisions, instead of arriving at a solution based solely on scientific principles. In some cases, the best overall decision may not be the best technical one.

Engineers, as construction managers, are expected to be sensitive to all of these issues and more, while at the same time seeing that a quality product is constructed for the customer. All this spells "challenge."

In addition to the concerns noted above, there are a number of core engineering issues that pre-

Building a replacement facility while enabling the existing facility to remain in service requires extensive knowledge and intuitive skills.

sent a major challenge for today's construction manager. As an example, it takes basic skills to construct a new facility from scratch, but it takes extensive knowledge and intuitive skills to build a replacement facility while enabling the existing facility to remain in service. Doing so requires innovative thinking, planning, and insight that only experience, supported by training-enhanced skills, can provide.

The Traditional Engineer

Most of us can recall having bosses who were exceptional in their technical field but not good managers or leaders. Today's employers, whether public or private, are seeking success through better management and leadership in all aspects of a project, including a willingness to adapt to change. They especially want managers who have strong people skills, an element many engineers have ignored during their careers.

Consider the following descriptions. Are you systematic, painstaking, thorough, and patient with detail? Do you adapt easily to routine? Do you emphasize logic and analysis? Are you practical, orderly, matter-of-fact, realistic, and dependable? If these descriptions fit you, you are a traditional engineer.

Now consider these descriptions. Are you original, independent, perceptive, and creative? Are you alert to all possibilities? Do you dislike routine? Are you skillful in handling people? Are you inspirational and enthusiastic? If these latter descriptions fit you, you are not a traditional engineer, yet these characteristics are necessary for engineers to be successful managers.

Whether because of training or by nature, engineers tend to dismiss fuzzy, value-oriented thinking, and generally believe there is one best way to do the job. They typically like clear, specific expectations with well-defined rules, and they focus quickly on the particulars that fit the rules. This approach can lead to unimaginative solutions that ignore special circumstances. Engineers can also get bogged down in details and miss the big picture. They like to emphasize the practical, measurable aspects of a situation, and are likely to focus on the here and now instead of thinking about the future and its implications. Thus they may overlook the broader ramifications of a decision because of an overemphasis on facts.

Issues Facing Today's Engineer

Today's construction managers face a broad range of competing issues. These issues fall roughly into five categories—political, social, environmental, economic, and technical.

Political

In the current political environment, doing the job right may not be good enough. Managers need to be aware of the political winds and sensitive to related issues. They must determine what is the right thing to do and make sure it is done right, all the while remaining cognizant of the political environment. If managers fail to make the right decision, someone else may make it for them.

Social

Every engineering project has an impact on society. Some societal impacts are encountered after the planning or design phase of a project has been completed. Occasionally, social issues become highly controversial, to the point of delaying phases of projects or even necessitating major changes after construction has begun. Some communities have passed socially based ordinances that impact projects. Thus managers can no longer ignore social issues.

Environmental

Like political and social issues, environmental concerns increasingly impact projects and present construction managers with a range of challenges. Construction managers have become more sensitive to environmental issues; indeed, engineers and environmentalists often work side by side during the construction phase of a project. Even so, environmental issues present challenges that can delay projects. As noted above, engineers tend to be thinkers, and environmental issues are value based. The result may be conflict when decisions must be made.

Economic

The best engineering solution is no longer adequate; the decision to build the best at all costs is probably not prudent. The complex economic issues that determine the fate of a project need to be considered in the construction phase. Is the best solution to a construction-related problem the one with the lowest initial cost? The answer is probably no. Engineers need to consider life-cycle

costing as well as cost–benefit issues. The cost of money also needs to be taken into account. Moreover, these economic issues may have to be considered when major changes or additions are being evaluated.

Conflicts often arise when economic issues are addressed. From a professional viewpoint, for example, decreasing liability results from building in a large number of safety factors, but doing so often results in excessive costs.

Technical

Engineering software is increasingly available, and in many cases necessary to do the job. With such technological advances comes the need to expand one's skills to exploit the new capabilities. Moreover, while the computer has made it easier to solve complex technical problems, it has also contributed to the challenges faced by construction managers. Computers have enabled engineers to build complex structures that would not previously have been possible. Use of computers may, however, lead to an engineering solution that costs more than an adequate alternative. In such cases, the construction manager, not the computer, must make the final decision.

In addition, an increasing number of projects now focus on rehabilitation, reconstruction, or expansion of an existing facility, structure, or building. This change in focus brings new demands. For example, building the Interstate system involved establishing rights-of-way with minimal effects on the traveling public. Rehabilitating or expanding these same facilities today while maintaining service requires multiphasing of projects, innovative thinking, and new methods and products. Likewise, building a major airport at a new site requires sound engineering skills, whereas expanding an existing airport while maintaining the flow of air traffic presents a variety of challenges for the construction manager.

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Construction managers must be aware of impacts on local businesses when planning and managing a highway project, such as construction of U.S. 41 in Fort Myers, Florida.

Necessary Skills

To be successful in addressing the above issues and challenges, construction managers need to be receptive to change. Among other things, managers must adjust to the computer information age and to the advent of a global economy. Mobility, though not a skill, is an increasingly important asset.

Today's construction managers must also look at the big picture, instead of focusing on individual elements of the work. They need to "think outside of the box." Construction managers often encounter problems when they expect everyone involved in a project to be as logical and analytical as they are. They need to stop and listen to others, and to consider feelings and values. This is not always easy for managers who have been trained as engineers.

Managers have to be good communicators. Effective communication requires listening, speaking, and writing skills that few engineers acquire in their formal education. Some engineers have good verbal skills, but lack listening and writing skills; some exhibit poor levels of all three.

Being bilingual would be a significant advantage for a construction manager. The ability to communicate in a second language not only would open up career opportunities unavailable to others, but also could enable a manager to communicate promptly and one on one, instead of through an interpreter at the time or later.

Managers need to be experts at managing people. In many organizations, engineers with good technical skills are promoted to management positions without consideration of their people skills. The resulting situation often is not a good one.

Skills in organizing, conducting meetings, planning, and managing time are essential as well.

Managers must occasionally act as facilitators when conflicts arise and issues need to be resolved in group formats.

Because of the increasing pressure that results from claims-driven projects, managers also have to be more conscious of legal pitfalls. They should be trained in contract language and liability issues.

Finally, managers need to acquire public relations skills. They must be able to handle media-related issues, inquiries from the general public, and agency/company matters.

Acquisition of Skills

Construction managers must recognize the need to acquire the above skills and then be willing to take the time to do so. There are ways to improve one's skills other than formal classroom training. For example, group discussions in workshops or seminars can be highly effective in imparting problem-solving and decision-making skills. These mechanisms are particularly useful in human relations, communication, and management training.

Communication is one of the most important areas in which many managing engineers need to improve. Public-speaking skills can be acquired by joining Toastmasters or similar organizations. Writing skills can be enhanced by attending courses offered through professional organizations or at universities. Listening skills can be learned in workshops or seminars.

New languages may not be easy for engineers to learn, but aside from the classroom environment, there are self-study methods available for the purpose. A combination of study and on-the-job learning may be most successful, particularly when working in an area where a second language is common and other staff are fluent in that language.

One form of specialized training that can be helpful in learning people skills focuses on personality recognition. The individual inventories his or her own preferences while recognizing other people's styles, and learns how communication with others can be improved. Two examples of such training are the Myers-Briggs Type Indicator and the Hogan-Champagne Personal Style Inventory.

Cross-training can often help engineers see the bigger picture. Construction managers need to appreciate the different phases of a project, from planning to design. This knowledge broadens the manager's view and can prove beneficial in making construction-related decisions.

Finally, the acquisition of skills in time management, financial management, interpretation of contract language, and engineering economics requires specialized training offered by professional training firms. Workshops and seminars are often used for this purpose.

Conclusion

The challenges for construction managers in the 21st century are both broad and complex. The evolving nature of the industry will mandate that managers continue to expand and improve both their technical and management skills. Those who are in the twilight of their careers have already been impacted. Those at the peak of their careers may have to reassess themselves periodically to determine the areas in which they need to reinforce their skills. Many in the early years of their careers are fortunate to have received some management training, but they are not immune to falling into a comfort trap. They must continue to develop state-of-the-art skills, and they need to focus on career development. Those who fail to keep up will be victims of the times.

In summary, an effective manager in the 21st century will need to be:

- Creative
- Innovative
- Intuitive
- Perceptive
- People-oriented
- Sensitive to public relations
- Proactive
- Nonadversarial
- Receptive to change
- Mobile
- A planner
- A global thinker
- A good communicator
- A facilitator
- A peacemaker
- A team player
- A partner
- A thinker

- Savvy about legal matters
- Sensitive to values and feelings
- Prepared to continue his/her education

Construction managers will need to be all of these things because they will have to:

- Recognize the big picture
- Make broad-based decisions
- Anticipate problems, avoid conflicts, and minimize claims
- Keep the job moving so it gets done on time
- Control costs
- Minimize delays or inconvenience to the customer or the public
- Ensure quality
- Satisfy the customer

Engineers cannot afford to become complacent. It has been suggested that "the term job security may be on the way to becoming an oxymoron" because "what engineers really need to focus on is career security" (*1*). Of prime importance in this process are communication and professional development to acquire the broad range of skills that will be demanded of construction managers in the 21st century.

Reference

1. Walesh, S. G. Engineering Management News. *ASCE News*, May 1998.