Managing Engineering and Technology 7th edition Morse Solutions Manual

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CHAPTER 1
Engineering and Management

DISCUSSION QUESTIONS

1-1. The precursors of today's engineers listed in the quotation from Wickenden had no classes and few or no books from which to learn scientific principles. How can you explain their success?

A: Certainly there was a great deal of trial and error, and lessons learned were passed on through long. Knowledge migrated slowly with the travels of artisans, and centers of unrecorded knowledge could disappear in the wake of conquerors or natural disaster. Nonetheless, the discoveries of some early thinkers (such as that of density measurement by Archimedes) were recorded, but progress was slow. In the Renaissance the leaders of scientific discovery in Europe maintained a correspondence with each other, and the written documentation of science and scientific progress began to accelerate.

1-2. Create your argument for why *engineering management* is different than *management*. Why is this field needed?

A: Student answers will vary. More credit should be earned by students who consider the breadth of engineering discussed in the text and why that breadth of activity might warrant specialized management. The simplest definition comes from Page 13 which differentiates the engineering manager as one who possesses both engineering and management skills. Full credit should not be earned by students who simply copy that definition or one of the others available on page 14. Instead students should use these elements to construct a definition in their own words and includes considerations from their own major.

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1-3. Why is it so difficult to answer the simple question "How many engineers are there in the United States?" Is the question "How many physicians are there in the United States?" any easier?

A: The number of physicians is normally taken as those who are licensed by a state to practice medicine, a matter of record. Registered professional engineers, on the other hand, represent a minority even of engineers who have graduated from accredited engineering programs, since few engineers in industry seek registration. Bureau of Labor Statistics data lists people currently employed in positions that normally require a graduate engineer, regardless of their original degree.

1-**4.** Compare and contrast the role of the engineer with the role of the manager. How are they similar and how are they different?

A: While the role of engineer and manager are often not considered to be similar by the general public, they have a number of similarities. Both professions are closely involved with decision making, analysis of data, and process design. Engineers differ from managers in that while both work to achieve desired results, engineers tend to focus on the equipment used to achieve those results while managers focus on people. The groups differ further in that the job of managers changes materially at different levels, while engineering tends to remain more similar until the engineer moves into an engineering management or management position.

1-5. What are the similarities in the definitions of *management* quoted from authors of management textbooks? How do *you* define management?

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A: Student responses will vary, but full credit should be earned by responses that consider the elements included in typical definitions. Management textbook definitions typically emphasize the achievement of organizational objectives through effective use of human and material resources.

Two examples of student definitions are:

* "Conversion of tangible and intangible resources of an individual or organization into the goals and desired results set by well-defined standards."

* "Utilization of human and material resources in an effort to produce quality products while minimizing costs and maximizing company profits.".

A web search of the definition returns:

* "the process of dealing with or controlling things or people."

1-6. How does the job of supervisor or first-line manager differ from that of a middle manager?

A: As a first line manager, supervisors are concerned with the performance of their direct reports in their direct roles to complete the work of the organization. They tend to have less say in the direction of the organization and instead focus on implementing the decisions of those at higher levels. For middle managers they are now in the role of manager of managers and must work to get work done through others. They often have more say in the direction of the organization, at least at the local level.

1-7. Engineers often move into management of their organizations. Explain the ways that an engineering degree prepares an individual for this transition? What are the problems with this path?

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A: Engineers learn how to be structured problem solvers in their undergraduate education, and many learn how to consider problems from a systems level perspective. Both of these skills are great benefits in a managerial role. However, engineers rarely learn much about many key business roles such as accounting, finance, and marketing. These are all business areas that impact decision making. In addition, engineering education tends to focus on the technical aspects of engineering, at the expense of developing the interpersonal skills needed to manage people. This focus on the technical at the expense of professional skills is changing in many engineering programs.

1-8. Identify the three types of skills needed by an effective manager, as conceived by Robert L. Katz, and describe how the relative need for them might vary with the level of management.

A: This question is answered in Figure 1-2 and the discussion under "Managerial Skills." Essentially, lower level managers will rely more heavily on their technical skills and have a lower need for conceptual skills. This balance reverses as one progresses to higher levels of management. Managers at all levels must rely on interpersonal skills.

1-9. Defend the need for engineering management. Why should engineering management be considered a different profession than simply "management."

A: While this question is similar to 1-2, this time we are not asking students to define engineering management, but defend it. Like specialized managers from other areas of the economy (e.g. healthcare management, sports management) the management of the engineering function in organizations demands specialized knowledge and skills. It is difficult to imagine successfully managing an engineering group without being able to

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understand their work. Furthermore, given the duty to protect the public that is paramount for engineers, it is critical that managers of those function have a similar worldview. In other words, managing engineering functions demands managers who are conversant with and adhere to the canons of engineering ethics.

1-10. Find the engineering management related subgroup for the professional society of your undergraduate discipline (e.g. IEEE for electrical engineers). What are the offerings of this society vs. those of ASEM? Which do you think will better serve your career development? Why?

A: The intent of this question is to promote life-long learning skills and student answers will vary widely. One comparison might be that of the Society for Engineering and Management Systems (SEMS) within the Institute of Industrial and Systems Engineers (IISE). SEMS offerings include a magazine type practitioner focused publication, networking, and both practitioner and research focused sessions at the IISE annual conference. By comparison, ASEM also offers networking and practitioner focused publications and networking and adds an annual conference focused solely on engineering management, a quarterly research journal in engineering management, classroom and training materials and professional certifications. Which of these offerings would be most beneficial to students in their career may depend on whether they intend to fully transition into engineering management (ASEM) or wish to remain closer to their original engineering focus (IISE, ASME, etc.).

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