

Preface

BACKGROUND

Faced with increasing competition from all parts of the world, almost every industry, business, and service organization is restructuring itself to operate more effectively. As downsizing and outsourcing become more common, these organizations must increase the intensity of cost reduction and quality improvement efforts while working with reduced labor forces. Cost-effectiveness and product reliability without excess capacity are the keys to successful activity in all areas of business, industry, and government and are the end result of methods engineering, equitable time standards, and efficient work design.

Also, as machines and equipment grow increasingly complex and semi-automated (if not fully automated), it is increasingly important to study both the manual components and the cognitive aspects of work as well as the safety of the operations. The operator must perceive and interpret large amounts of information, make critical decisions, and control these machines both quickly and accurately. In recent years, jobs have shifted gradually from manufacturing to the service sector. In both sectors, there is increasingly less emphasis on gross physical activity and a greater emphasis on information processing and decision making, especially via computers and associated modern technology. The same efficiency and work design tools are the keys to productivity improvement in any industry, business, or service organization, whether in a bank, a hospital, a department store, a railroad, or the postal system. Furthermore, success in a given product line or service leads to new products and innovations. It is this accumulation of successes that drives hiring and the growth of an economy.

The reader should be careful not to be swayed or intimidated by the latest jargon offered as a cure-all for an enterprise's lack of competitiveness. Often these fads sideline the sound engineering and management procedures that, when properly utilized, represent the key to continued success. Today we hear a good deal about reengineering and use of cross-functional teams as business leaders reduce cost, inventory, cycle time, and nonvalue activities. However, experience in the past few years has proved that cutting people from the payroll just for the sake of automating their jobs is not always the wise procedure. The authors, with many years of experience in more than 100 industries, strongly

recommend sound methods engineering, realistic standards, and good work design as the keys to success in both manufacturing and service industries.

WHY THIS BOOK WAS WRITTEN

The objectives of the thirteenth edition have remained the same as for the twelfth: to provide a practical, up-to-date college textbook describing engineering methods to measure, analyze, and design manual work. The importance of ergonomics and work design as part of methods engineering is emphasized, not only to increase productivity, but also to improve worker health and safety and thus company bottom-line costs. Far too often, industrial engineers have focused solely on increasing productivity through methods changes and job simplification, resulting in overly repetitive jobs for the operators and increased incidence rates of musculoskeletal injuries. Any cost reductions obtained are more than offset by the increased medical and workers' compensation costs, especially considering today's ever-escalating health-care costs.

WHAT'S NEW IN THE THIRTEENTH EDITION

A new Section 16.4 on standards in service work has been added, showing application of work measurement to call centers and health care. Approximately 10 to 15 percent more examples, problems, and case studies have been added. The thirteenth edition still provides a continued reliance on work design, work measurement, facilities layout, and various flow process charts for students entering the industrial engineering profession, and serves as a practical, up-to-date source of reference material for the practicing engineer and manager.

HOW THIS BOOK DIFFERS FROM OTHERS

Most textbooks on the market deal strictly either with the traditional elements of motion and time study or with human factors and ergonomics. Few textbooks integrate both topics into one book or, for that matter, one course. In this day and age, the industrial engineer needs to consider both productivity issues and their effects on the health and safety of the worker simultaneously. Few of the books on the market are formatted for use in the classroom setting. This text includes additional questions, problems, and sample laboratory exercises to assist the educator. Finally, no text provides the extensive amount of online student and instructor resources, electronic forms, software tools, current information, and changes as this edition does.

ORGANIZATION OF THE TEXT AND COURSE MATERIAL

The thirteenth edition is laid out to provide roughly one chapter of material per week of a semester-long introductory course. Although there are a total of

18 chapters, Chapter 1 is short and introductory, much of Chapter 7 on cognitive work design and Chapter 8 on safety may be covered in other courses, and Chapter 15 on standards for indirect and expense work may not have to be covered in an introductory course, all of which leaves only 15 chapters to be covered in the semester.

A typical semester plan, chapter by chapter, using the first lecture number, might be as follows:

Chapter	Lectures	Coverage
1	1	Quick introduction on the importance of productivity and work design, with a bit of historical perspective.
2	3–6	A few tools from each area (Pareto analysis, job analysis/ worksite guide, flow process charts, worker– machine charts) with some quantitative analysis on worker–machine interactions. Line balancing and PERT may be covered in other courses.
3	4	Operation analysis with an example for each step.
4	4	Full, but can gloss over basic muscle physiology and energy expenditure.
5	4	Full.
6	3–4	Basics on illumination, noise, temperature; other topics as desired may be covered in another course.
7	0–4	Coverage depends on instructor’s interest; may be covered in another course.
8	0–5	Coverage depends on instructor’s interest; may be covered in another course.
9	3–5	Three tools: value engineering, cost-benefit analysis, and crossover charts; job analysis and evaluation, and interaction with workers. Other tools may be covered in other classes.
10	3	Basics of time study.
11	3–5	One form of rating; first half of the allowances that are well established.
12	1–3	Coverage of standard data and formulas depends on instructor’s interest.
13	4–7	Only one predetermined time system in depth; the second may be covered in another course.
14	2–3	Work sampling.
15	0–3	Coverage of indirect and expense labor standards depends on instructor’s interest.
16	2–3	Overview and costing.
17	3–4	Day work and standard hour plan.
18	3–4	Learning curves, motivation, and people skills.

The recommended plan covers 43 lectures, with 2 periods for examinations. Some instructors may wish to spend more time on any given chapter, for which additional material is supplied, for example, work design (Chapters 4 to 7), and less time on traditional work measurement (Chapters 8 to 16), or vice versa. The text allows for this flexibility.

Similarly, if all the material is used (the second lecture number), there is enough material for one lecture course and one course with a lab, as is done at Penn State University. Both courses have been developed with appropriate materials such that they can be presented completely online. For an example of an online course using this text, go to www.engr.psu.edu/cde/courses/ie327/index.html

SUPPLEMENTARY MATERIAL AND ONLINE SUPPORT

The thirteenth edition of this text continues to focus on the ubiquitous use of PCs as well as the Internet to establish standards, conceptualize possibilities, evaluate costs, and disseminate information. A website, hosted by the publisher at <http://highered.mcgraw-hill/sites/0073376310/>, furthers that objective by providing the educator with various online resources, such as an updated instructor's manual. DesignTools version 4.1.1, a ready-to-use software program for ergonomics analysis and work measurement, appears on the site as well. A special new feature of DesignTools is the addition of QuikTS, a time study data collection app for the iPad and iPhone.

The book's website also links to a website hosted by the author at www2.ie.psu.edu/Freivalds/courses/ie327new/index.html, which provides instructors with online background material, including electronic versions of the forms used in the textbook. Student resources include practice exams and solutions. Up-to-date information on any errors found or corrections needed in this new edition appear on this site as well. Suggestions received from individuals at universities, colleges, technical institutes, industries, and labor organizations that regularly use this text have helped materially in the preparation of this thirteenth edition. Further suggestions are welcome, especially if any errors are noticed. Please simply respond to the OOPS! button on the website or by email to axf@psu.edu

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