mention scheduling such projects using Q-GERT in passing. It would have been useful to include an example. There is one factual error about the HDTV: Japan, by jumping in early to develop HDTV by refining the current analog technology, actually lost the race to the US as the technology moved towards digital. Project termination and pruning and improving the portfolio are well covered.

Chapter 13 concerns the criteria for choosing software for managing projects. The authors include a list of currently available software packages and their vendors.

In the last chapter, the authors discuss the termination of projects—the factors leading to premature termination—and provide an excellent review of this important topic. One aspect they do not discuss here is the disposition of personnel after a project is terminated prematurely.

A running team project throughout the book—"Thermal transfer plant"—provides students with a continuous platform with which to practice the lessons from the chapters. At the end of each chapter, the authors provide an extensive set of discussion questions and problems. The book is well written with many examples. The large numbers of references at the end of each chapter are categorized according to topic and are up-to-date.

Compared to the other texts commonly used for courses on project management (for example, Meredith and Mantel [1989], and Nicholas [1990]), this book covers many aspects of the topic, especially the mathematical and operations research parts, in greater depth. The emphasis on mathematical approaches in many chapters may make the book suitable for engineering students, but I am not so sure about its reception in business schools. One could skip some of the complex mathematical models. I would have felt more comfortable if some of the mathematical models had been confined to appendices.

The inclusion of technology issues and R&D projects are a definite strength of this book; they are especially useful in business today. A final plus for this book is the inclusion of a software program (Super Project Expert® from Computer Associates). This will be of great help to teachers and students.

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PINEDO, MICHAEL 1995, *Scheduling: Theory, Algorithms, and Systems*, Prentice Hall, Englewood Cliffs, New Jersey, 378 pp., $49.95.

With the recent emphasis on manufacturing in the US economy, we have also seen an increased offering of manufacturing courses in engineering schools and in particular courses in scheduling. Suitable textbooks to cover such courses have, however, been curiously lacking: The old books of Conway, Maxwell, and Miller [1967], and Baker [1974] contained much sound engineering advice and practice but almost entirely predated the upsurge of modern scheduling theory as it developed (hand in hand with the advances in computing) in the 1970s. The discoveries of computational complexity, which allowed a rich classification of most scheduling problems into polynomially solvable (rather few) and NP-hard (most of them), were documented in research monographs by such authors as Lenstra [1977] and Rinnooy Kan [1976] and in the comprehensive textbook by French [1982]. By that time, however, the emphasis had shifted to the mathematical-computer science aspects of the theory, and much of the engineering motivation had been lost. In this new textbook, Pinedo aims to fill the gap by providing both an up-to-date account of the algorithmic theory of scheduling and a thorough and authoritative discussion of the practical aspects of implementing a scheduling system in the manufacturing plant. The topic of stochastic scheduling is also included in the book, for the first time.

The book is divided into three parts: In Part I (chapters 2–7), Pinedo deals with deterministic scheduling models. The problem here is to schedule a given batch of jobs on a set of machines to minimize a single objective function. In chapter 2, the author introduces notation and classification of problems; in chapter 3, he deals with single machine scheduling; in chapters 4 and 5 with parallel machines and flowshops (machines in series) respectively; in chapter 6, he discusses job shops; and in chapter 7, he describes some generic methods with broad applications in scheduling, such as dispatch rules, local improvement schemes, filtered beam search (branch and bound heuristics), and constraint guided heuristic search. In chapters 3–6, the emphasis shifts as the problems become harder from exact algorithms to heuristic methods. Pinedo chooses the models and algorithms included in this part carefully from among the many thousands of available problems to provide insight, illustrate the main ideas, and cover the most widely occurring practical situations.

In Part II (chapters 8–11), Pinedo describes, for the first time in a book, the recent developments in stochastic scheduling, to which he has made many contributions. The emphasis is again on scheduling a batch of jobs on a set of machines; however, now the processing times, release times and due dates are only partially known, and the uncertainty in the data is described by probability distributions; the expected value of a single objective function is minimized. The author presents the framework for stochastic scheduling theory in chapter 4 and discusses single machine, parallel machine, and shop models in each of the succeeding chapters.

Part III (chapters 9–14) is about systems design; it concerns applications and is of outstanding importance. In chapter 12, Pinedo analyzes four scenarios. It is clear that these, unlike the models described earlier in the book, are scenarios that capture the essence of an actual manufacturing facility. As a result, they are more complex than many of the previous models. Nevertheless, the author presents heuristic methods, based on algorithms and insights gained from simpler models, for each scenario, which provide practical good solutions. In chapter 13, he discusses the many important issues that face the engineer in providing a scheduling system for a plant; these include architecture, databases, interfaces, and schedule generators. Chapter 14 includes four case studies of existing systems. Pinedo chooses AHP Leitstand (sadly defunct now) to illustrate a commercial generic system. The next describes two custom-designed scheduling systems, one from the packaging industry and one from air traffic. Last he describes an academic prototype system he recently created. In this part of the book, the author defines the current state of the art of scheduling practice.

The book is written with extreme care for details, proofs are very clearly presented, and the general flow of ideas is excellent. Hundreds of exercises, both theoretical (for the graduate student) and computational (for the undergraduate and graduate!) are included and form a major asset of the book. The comprehensive coverage of both the theory and practice of scheduling make this textbook suitable for scheduling courses at both the undergraduate and graduate level, for students of industrial engineering as well as other engineering students, and students of management and computer science. It should also find much use among practitioners of scheduling.

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DEN HERTOG, D. 1994, *Interior Point Approach to Linear, Quadratic, and Convex Programming,* Kluwer Academic Publishers, Dordrecht, The Netherlands, 208 pp., $108.00.

Although researchers proposed and analyzed interior point methods (IPMs) for solving nonlinear programs as early as the 1960s, the research community began paying careful attention to the approach only a decade ago when Karmarkar [1984] published his projective algorithm for solving linear programming problems. The literature on IPMs now spreads over about 2,000 research articles and warrants a comprehensive volume.

den Hertog basically discusses two variants of interior point methods, the logarithmic barrier method and the center method, and provides in-depth analysis of these methods for the case of linear and smooth convex programs from a unified framework. In much of the analysis, he uses the notion of self-concordance [Nesterov and Nemirovski 1994], which he explains briefly in Appendix A.

There are six chapters in the book. Chapter 1 is introductory in nature and the author does a nice job in its organization. In chapter 2, he presents a general introduction to the logarithmic barrier method. He then covers special cases, such as linear, convex quadratic, and smooth convex programming problems. He provides detailed analysis for long, medium, and short step lengths. I found the discussions on