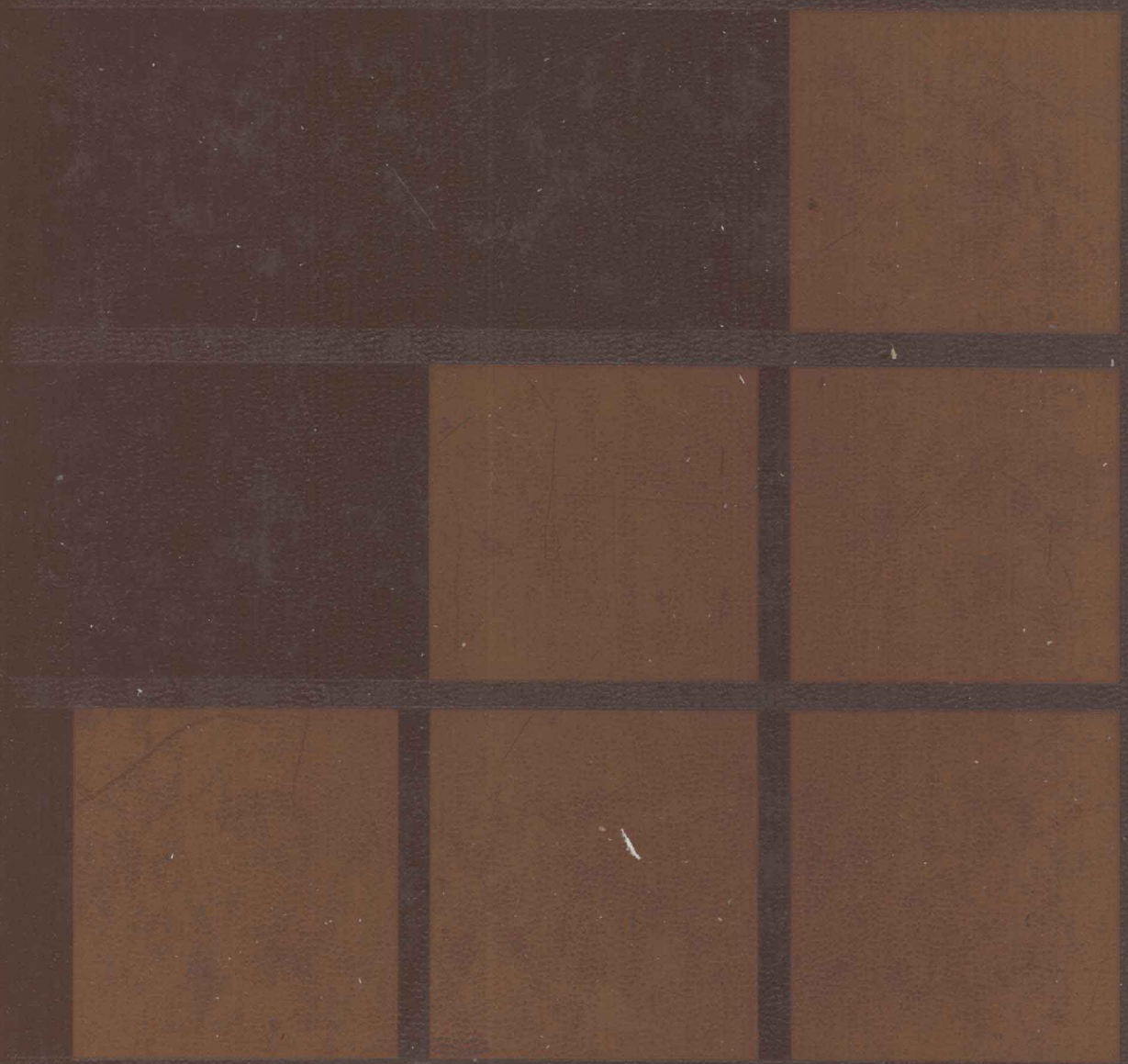
OPERATIONS MANAGEMENT

Planning and Control of Operations and Operating Resources



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Planning and control of operations and operating resources

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1981

BUSINESS PUBLICATIONS, INC.
Plano, Texas 75075
IRWIN-DORSEY LIMITED
Georgetown, Ontario L7G 4B3

ISBN 0-256-02442-1
Library of Congress Catalog Card No. 80–69796

Printed in the United States of America

1 2 3 4 5 6 7 8 9 0 H 8 7 6 5 4 3 2 1

preface

Operations Management is a textbook that introduces students to the planning and control of operations and operating resources in any type of firm. The text addresses the production/operations management (P/OM) topics that are required by the accrediting agency for the nation's schools of business (The American Assembly of Collegiate Schools of Business). The text is suitable as well for the introductory production planning and control course in an industrial engineering curriculum.

The five chapters on production and inventory management (Chapters 2, 3, 4, 5, and 6) present, in an integrated fashion, much of the material covered in the five exams leading to professional status as a Certified Production and Inventory Manager (CPIM). The CPIM exams and certification are administered by the American Production and Inventory Control Society.

The book covers standard topics of modern P/OM, but its modes of presentation are a bit different. Four aspects of the book's style of presentation are:

1. A distinction between operations and operating resources, and a central model carried forward through the book to reiterate the distinction and integrate the chapters.
2. Depth of presentation.
3. A blend of science and practicality.
4. Application-oriented problems and cases that help students to relate, to integrate, to discover, and, in general, to gain useful insights.

A bit more may be said about each of these aspects of the book's style.

Distinctions and integrative model

Some years ago an article entitled "The Resources Management Movement: The Coming Death of Production Management Education" appeared in the *Academy of Management Journal.* It was written by a doctoral student named Richard Schonberger. The field has not developed in quite the naive way prophesied in the article. But develop it has! And toward resources management. *Material* requirements planning, *capacity* requirements planning, *resource* requirements planning, and Wight's broader notion of *manufacturing resource* planning—these developments made the 1970s an era of change in

P/OM that seems unparalleled unless one goes back to the Taylor and Gilbreth era.

Resources, or means, or capacity management has received increasing attention in P/OM research and textbooks. This book carries the idea forward. The title emphasizes operating resources; within the book the functions of operating resources management are grouped to comprise about half of an operations management model—a model that serves as a focal point for each chapter.

Depth

The typical P/OM course includes a sizable breadth of topics, concepts, and techniques. P/OM textbooks have gotten fatter, and instructors must either selectively omit a number of topics or find themselves flitting from topic to topic too quickly for students to attain mastery. My way of dealing with the problem has been *(a)* to leave out what seems less essential and *(b)* to treat what is essential in more depth than there is usually room for in P/OM books.

Leaving out topics requires making some difficult choices, and the responsibility for any poor choices is all mine. If I followed a principle in making choices about topical coverage, the principle probably was that production/operations management is not the same as operations research (OR). Other recent P/OM textbooks also seem to have steered away from OR. One reason is improved understanding of the uniqueness of P/OM. Another reason is that to an increasing extent OR has become an early tool course in business and engineering curricula.

Added depth of coverage largely concerns *reasons* for using or not using a given concept or technique. Effort is made not to oversell P/OM concepts and techniques, but rather to show the need for careful choice and for fitting the technique to the situation. A P/OM course is a *management* course, and when and where to use a managerial technique seem to warrant space in the course.

Science and practicality

This book gives little emphasis to the art of operations management. Artfulness is probably a blend of instinct, common sense, and aptitude in the experienced operations manager. More suitable for study in a book is the science of operations management. By science we do not mean mathematical models or algorithms. Those have an important but not an exclusive place in this book. Rather, the science of operations management is a systematic approach. A systematic approach may employ mathematical models, algorithms, heuristics, or procedures, and the chapters include a mix of all of these. In some chapters mathematical approaches dominate because the approaches have been proven to work in the firm; Chapter 9, Quality Assurance, is a good example. By contrast, proven procedural approaches dominate in Chapter 8, Methods, Processes, and Work Measurement: The subject matter of that chapter is nonmathematical (beyond basic arithmetic) but highly systematic.

Like most recent P/OM books, this one considers the delivery of services as well as the manufacture of goods. Better understanding of manufacturing

management has led us to a better understanding of what *service* operations management is—and is not. We know, for example, that all of the P/OM *functions* apply to both services and manufacturing. But many of the sophisticated *techniques* of manufacturing management do not apply in the services environment, except by force fit. There is little to be said about services in a discussion of, say, material requirements planning, because MRP plans manufacturing inventories. For a different reason, there is not much to be said about services in a chapter on quality assurance. While quality is often of the essence in services, formal QA techniques (such as statistical quality control) require objective measures of quality. In services, measures of quality are not only subjective opinions, but they must also be gleaned from clients/customers with a varying willingness to be randomly sampled. On the other hand, a sizable number of P/OM techniques are useful in both manufacturing and services. For example, in Chapter 2, Demand Forecasting and Order Acceptance, services and manufacturing examples are given nearly equal weight.

Application-oriented problems and cases

The problems at the ends of chapters are a mixture of types, but in general they emphasize realistic applications. Many have multiple parts, just as problems in a real organization do. The problems are grouped by topics, and some are presented in ways that permit multiple answers; with only one answer some students may choose not do their own work, which compromises the value of doing the assignment.

I would like to acknowledge those who contributed ideas and other support to the book. First, I want to thank University of Nebraska colleagues who provided advice and criticism: Sang Lee, Gary Green, Les Digman, and Paul Wyman. I am most indebted to five gentlemen who, in reviewing the manuscript, set me straight on numerous key issues: Ed Davis, University of Virginia; Russ Morey, Western Illinois University; Jim Dier, University of Texas; Roy Williams, Memphis State University; and John Anderson, University of Minnesota. I also thank Bob Hall, Indiana University, for sharing with me some of the lastest thinking of the Repetitive Manufacturing Group of APICS; and Ray Lankford, Plossl and Lankford, Inc., for his helpful advice on capacity planning.

The office staff—Joyce Anderson, Jane Chrastil, and several others—also deserve thanks. They not only met tight typing schedules but also made artful sense out of many of my crude drawings.

Finally, my most sincere appreciation goes to my wife, Nancy, who begrudged none of my efforts. She encouraged me all the way. Really, she did.

Richard J. Schonberger

A NOTE TO THE STUDENT

What can you, the student, expect to learn about operations management by using this basic operations management textbook? The following provides a general idea.

After completing your studies, you should:

Thoroughly understand that . . .

Every organization has an operations function—transformation of operating resources into goods or services.

Successful operations are meticulously planned and controlled.

Have a general knowledge of the components of the operations function:

Translation of item demand into master schedules, process plans, and detailed schedules.

Translation of aggregate demand into plans for fixed capacity (plant and equipment) and adjustable capacity (labor, materials, and tools).

Maintenance and control of operating inputs and outputs.

Clearly understand how and where quantitative models (most of which you have learned about in previous studies) can be helpful to operations management staff.

Have a working knowledge of the large variety of procedural models that are unique to the operations management field—for example, order-processing procedures, material requirements planning, statistical quality control, time standards, and assembly-line balancing.

Be easily able to identify the major types of operations—repetitive, job, project, and hybrids—and have a general understanding that operations management tools and techniques are not universal but depend on type of operation.

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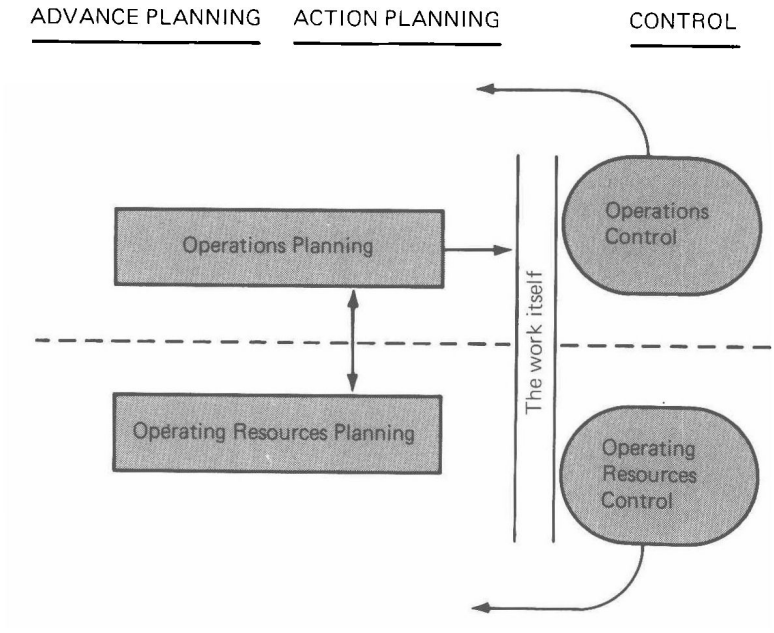
PART ONE

Introduction to operations/operating resources management



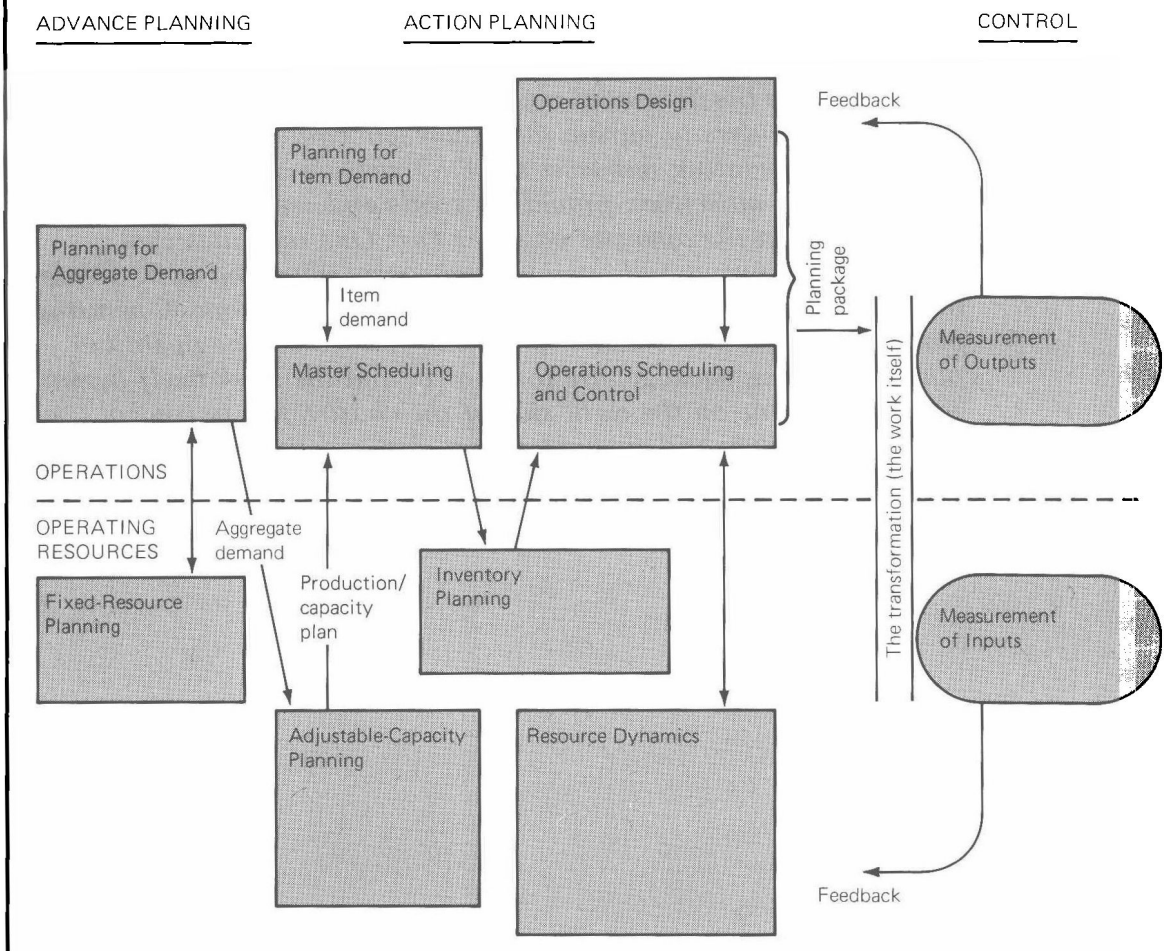
CHAPTER 1
Functions of operations/operating resources management

Part One, the introduction to this book, consists of a single chapter, Chapter 1, on the functions of operations/operating resources management. A dashed horizontal line in the chart on the opening page of Chapter 1 divides operations management from operating resources management. The distinction is emphasized in the book. Operations *are the dominant objectives. Any tendencies of* operating resourses *providers to pursue their own parochial interests are disruptive. Operating resources serve no purpose other than support for operations objectives: providing goods and services.*

The chart on the opposite page for Part One indicates that operations planning and operating resources planning each divide into an advance-planning and an action-planning zone. Operating plans emerge from the action-planning functions. The operating plans (planning package) are forwarded, and the work itself begins. The control zone on the right side of the chart refers to control over operating outputs and resource inputs. Information for control is fed back to the planners for corrective action.

chapter 1

FUNCTIONS OF OPERATIONS/ OPERATING RESOURCES MANAGEMENT



This is a book about managing ends and means. Productive *operations,* resulting in goods and services, are the ends, and *operating resources* are the means.

Much of getting jobs done today is technological. The engineer (or designer) designs the good or the service and perhaps also designs ways to provide it. The manager facilitates this. This book concerns the management role, that is, the management of operations and operating resources.

Management of operations and operating resources is a matter of planning, supervision, and control. Supervision is not included in this book, because it is a *general* function, not one that is unique to operating personnel. Being a general function, supervision is best examined in general studies in organizational behavior and personnel administration.

PLANNING AND CONTROL: TOOLS AND MODELS

Thus the focus of this book may be narrowed to planning and control. There is much to say about both. Packed into the modern course in operations management (or production management) are a large variety of planning and control tools. These studies are less conceptual than are most courses in management or administration. Instead more emphasis is placed on techniques—graphic, mathematical, and procedural.

The graphic tools are the heritage of the pioneers of scientific management, whose work began around the turn of the century. They used numbers for measurement but did not rely much on mathematical approaches. Work sequence charts are one prominent example of a graphic tool. A very general example is shown in Figure 1–1. There are many variations and many meanings assigned to the arrows and circles (or other geometric figures) in a work sequence chart, and the variations are referred to by many names, including flowchart, block diagram, network, lead-time chart, gozinto chart, and assembly diagram.

Various mathematical and statistical tools were pulled together during World War II as the foundation for operations research (OR). Linear programming and statistical probability distributions are examples of OR (mathematical) and statistical tools, respectively, that some readers may be familiar with. OR was

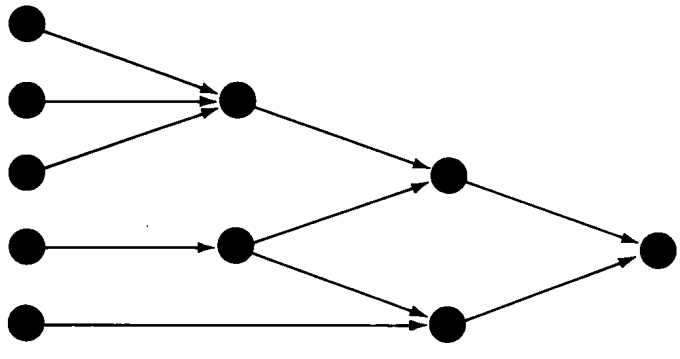


FIGURE 1–1
A graphic tool: The work sequence chart