# PRODUCTION AND OPERATIONS MANAGEMENT

### Raymond R. Mayer

Walter F. Mullady Professor of Business Administration Loyola University of Chicago

TECHNISCHE HOCHSCHULE DARMSTADT
Fachbereich 1
Gesamtbibliothek
Betriebswirtschattslehre
Inventar-Nr.: 36.323
Abstell-Nr. : A25/458
Sachgebiete:
4
00226370

INTERNATIONAL STUDENT EDITION

#### McGRAW-HILL INTERNATIONAL BOOK COMPANY

Auckland Bogotá Guatemala Hamburg Johannesburg Lisbor London Madrid Mexico New Delhi Panama Paris San Juan São Paulo Singapore Sydney Tokyo

# CONTENTS

Preface

χv

#### 1 THE PRODUCTION AND OPERATIONS FUNCTION

TOPICS: Production and society • Definition of wealth • Production and the organization • Role of finance and marketing • The operations management system • Responsibilities of operations personnel • Topics to be considered • Positions in operations management • Production of goods and services • Differences in production management systems

#### 2 METHODS OF FORECASTING DEMAND

16

TOPICS: Definition of production planning • Role of sales forecasting • Required form of forecasts • Length of forecast period • Collective opinion method • Delphi technique • Economic indicators • Simple regression analysis • Coefficient of correlation • Multiple regression • Curvilinear relationships • Time series analysis • Exponential smoothing • Revision of forecasts

TOPICS: Definition of factors of production • Determination of component-part requirements • Role of bill of materials • Determination of factor-of-production requirements • Role of operation, or routing, sheet • Adjustments for defective output • Adjustments for labor efficiency • Learning curves • Waiting lines, or queues • Monte Carlo simulation • Material requirements planning • Resources for nonstandard goods and services • Need to modify demand schedules for resources • Break-even charts

#### 4 FINANCIAL ANALYSIS OF OPERATING PLANS

108

TOPICS: Need for cost comparisons • Profit versus cost comparisons • Recurring costs • Capital costs • Cost of money • Compound interest factors • Uniform annual cost method • Equal service-period requirement • Assumption with regard to future replacements • Need to satisfy rate-of-return requirement • Present worth method • Relationship between a uniform annual cost and a present worth • Irreducible factors • Case of incomplete cash-flow patterns • Forecasting future replacements • Other applications of cost comparison methods

# 5 DETERMINATION OF ECONOMIC ORDER QUANTITIES

154

232

PART I TOPICS: Inventory control and order size determination •
Factors affecting order quantities • Inventory classification systems •
An economic lot size formula under the condition of certainty • Fixed-order versus fixed-interval systems • Quantity discounts • Another economic lot size formula under certainty • Rule-of-thumb selection under certainty

PART II TOPICS: Simulation under the condition of risk • Service levels • A profit-comparison approach under risk • A profit-comparison approach under the condition of uncertainty • A cost-comparison approach under risk • A cost-comparison approach under uncertainty • Safety stock determination

### 6 LAYOUT, HANDLING, AND LOCATION DECISIONS

TOPICS: Building requirements and the plant layout • Development of the plant layout • Departmentalization of activities • Line balancing •

Ascertaining departmental space requirements • The departmental arrangement • Operation process charts • Flow diagrams • Determination of handling-equipment requirements • Types of handling equipment • Factors affecting the choice of handling equipment • Location and layout of work stations • Determination of space requirements • Plant location and its selection

# 7 RESOURCE PROCUREMENT AND OPERATIONS CONTROL

284

TOPICS: Resource procurement in a new organization • Resource procurement in an existing organization • Make-or-buy decisions • The purchasing function • The production control system • Authorizations to produce • Master schedules • Processing instructions • Determination of availability of required resources • Work scheduling • Issuing instructions and authorizations • Dispatching • Preparation of progress reports • Gantt charts • Actions related to behind-schedule and ahead-of-schedule conditions • Differences in operations control systems

# 8 PROJECT SCHEDULING AND RESOURCE ALLOCATION

333

387

PART I TOPICS: Special scheduling techniques • Critical Path
Method • Determination of slack times • Interpretation of slack-time
values • Program Evaluation and Review Technique • Probability of
meeting a target completion date

PART II TOPICS: The resource allocation problem • Linear programming • A profit maximization problem • Graphical and algebraic approaches • Available algorithms • A cost minimization problem • Other applications of linear programming • Other programming techniques • Summation of operations planning and control

### 9 DEVELOPMENT OF EFFICIENT WORK METHODS

TOPICS: Material flow process chart • Man flow process chart • Workstation flow process charts • Man-and-machine chart • Multiple-activity process charts • Operator process chart • Principles of motion economy • Simultaneous motion cycle (simo) chart • Micromotion studies • Comparing alternative work methods • Labor considerations in methods analyses • Safety and health considerations • Maintenance of production facilities • Optimum combination of preventative maintenance and corrective maintenance

TOPICS: Standard, actual, and normal times • Stopwatch time study • Methods of timing • Performance rating methods • Determination of the normal time • Allowance factors and production studies • Work sampling, or ratio-delay, studies • Determination of the standard time • Development of standard data • Application of standard data • Predetermined elemental time systems • Calculating employee efficiency • Work standards based on judgment

#### 11 EMPLOYEE MOTIVATION

498

TOPICS: Job enrichment and enlargement • Other nonfinancial incentives • Supplementary compensations, or fringe benefits • Base pay as a financial incentive • Merit increases in base pay • Daywork method of wage payment • Individual wage incentive plans • Length of incentive period • Recommendations for a successful wage incentive installation • Group wage incentive plans • Profit sharing plans • Other financial incentives • Summation of means for maximizing operating efficiency

### 12 QUALITY ASSURANCE

546

PART I TOPICS: Prerequisites for satisfactory quality • Inspection of past output • Sample inspection versus 100 percent inspection • Acceptance sampling by attributes • Design of a single-sample acceptance sampling plan • Double-sample and multiple-sample plans • Sequential sampling • Acceptance sampling by variables

PART II TOPICS: Control of future quality
defective
Control charts for defects
Control charts for ranges
Control charts for ranges
Summation of a quality assurance
program

### 13 A RETROSPECTIVE VIEW

622

TOPICS: Subjects related to operations management • Effect of the economic system on production management • Maximizing the satisfaction of wants for goods and services • Choice of goods and services to be produced • Importance of the work ethic • Fulfillment of psychic, or spiritual, needs • Production and distribution

TABLES: Square roots • Logarithms • Random numbers • Single-amount future worth factor • Single-amount present worth factor • Uniform-series present worth factor • Present-amount annuity factor • Areas of the normal curve • Cumulative values of Poisson probabilities • Values of  $d_2$  and  $d_3$  factors for the R chart

Index

643