

This International Student Edition is for use outside of the U.S.



# Service Management

Operations, Strategy, Information Technology

Ninth Edition



**Mc  
Graw  
Hill**  
Education

**Bordoloi • Fitzsimmons • Fitzsimmons**

# Service Management

Operations, Strategy,  
Information Technology

Ninth Edition

**Sanjeev Bordoloi**

*Associate Professor of Operations  
Management  
University of St. Thomas, Minnesota*

**James A. Fitzsimmons**

*Seay Professor of Business Emeritus  
University of Texas at Austin*

**Mona J. Fitzsimmons**

**Mc  
Graw  
Hill  
Education**





## SERVICE MANAGEMENT

Published by McGraw-Hill Education, 2 Penn Plaza, New York, NY 10121. Copyright © 2019 by McGraw-Hill Education. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written consent of McGraw-Hill Education, including, but not limited to, in any network or other electronic storage or transmission, or broadcast for distance learning.

Some ancillaries, including electronic and print components, may not be available to customers outside the United States.

This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 LW1 21 20 19 18

ISBN 978-1-260-09242-4

MHID 1-260-09242-9

Cover Image: ©Shutterstock/Monkey Business Images, ©swarebreakmediamicro/123RF, ©gettyimages/Getty Images, ©Kistock/Blend Images LLC

HD  
9980.5  
B64  
2019

00077930

All credits appearing on page or at the end of the book are considered to be an extension of the copyright page.

The Internet addresses listed in the text were accurate at the time of publication. The inclusion of a website does not indicate an endorsement by the authors or McGraw-Hill Education, and McGraw-Hill Education does not guarantee the accuracy of the information presented at these sites.

# Brief Contents

## PART ONE

### Understanding Services 1

- 1 The Service Economy 3
- 2 Service Strategy 27

## PART TWO

### Designing the Service Enterprise 61

- 3 New Service Development 63
- 4 The Service Encounter 95
- 5 Supporting Facility and Process Flows 119
- 6 Service Quality 149
- 7 Process Improvement 187
- Supplement: Data Envelopment Analysis (DEA) 209
- 8 Service Facility Location 219

## PART THREE

### Managing Service Operations 247

- 9 Service Supply Relationships 249
- 10 Globalization of Services 279
- 11 Managing Capacity and Demand 301
- 12 Managing Waiting Lines 335
- 13 Capacity Planning and Queuing Models 357
- Supplement: Computer Simulation 382

## PART FOUR

### Quantitative Models for Service Management 401

- 14 Forecasting Demand for Services 403
- 15 Managing Service Inventory 427
- 16 Managing Service Projects 461

## APPENDIX

- A Areas of Standard Normal Distribution 495
- B Uniformly Distributed Random Numbers  $[0, 1]$  496
- C Values of  $L_q$  for the  $M/M/c$  Queuing Model 497
- D Equations for Selected Queuing Models 499

## NAME INDEX 505

## SUBJECT INDEX 509



# Table of Contents

## PART ONE

### UNDERSTANDING SERVICES 1

#### Chapter 1

##### The Service Economy 3

Learning Objectives	3
Chapter Preview	4
Service Definitions	4
Facilitating Role of Services in an Economy	4
Economic Evolution	5
Stages of Economic Development	6
Preindustrial Society	6
Industrial Society	7
Postindustrial Society	7
Nature of the Service Sector	8
The Experience Economy	9
Consumer Service Experience	10
Business Service Experience	10
Service-Dominant Logic	11
Distinctive Characteristics of Service Operations	13
Customer Participation	13
Simultaneity	14
Perishability	14
Intangibility	15
Heterogeneity	15
Nontransferable Ownership	16
The Service Package	17
Grouping Services by Delivery Process	18
Open-Systems View of Service Operations	
Management	20
Service Benchmark: Sharing Economy Pioneers Uber and Airbnb	22
Summary	22
Key Terms and Definitions	22
Topics for Discussion	23
Interactive Exercise	23
CASE 1.1: Village Volvo	23
CASE 1.2: Xpresso Lube	24
Selected Bibliography	26
Endnotes	26

#### Chapter 2

##### Service Strategy 27

Learning Objectives	27
Chapter Preview	27
The Strategic Service Vision	28
Understanding the Competitive Environment of Services	29

Competitive Service Strategies	30
Overall Cost Leadership	30
Differentiation	31
Focus	32
Strategic Analysis	33
Porter's Five Forces Analysis	33
SWOT Analysis: Strengths, Weaknesses, Opportunities, Threats	34
Winning Customers in the Marketplace	34
Qualifiers	35
Service Winners	35
Service Losers	36
Sustainability in Services	36
Triple Bottom Line (TBL)	36
The Competitive Role of Information in Services	38
Creation of Barriers to Entry	38
Revenue Generation	40
Database Asset	40
Productivity Enhancement	41
The Internet of Things (IoT)	42
Data Analytics in Services	44
The Virtual Value Chain	45
First Stage (New Processes)	46
Second Stage (New Knowledge)	47
Third Stage (New Products)	47
Fourth Stage (New Relationships)	47
Economics of Scalability	47
Limits in the Use of Information	48
Anticompetitive	48
Fairness	49
Invasion of Privacy	49
Data Security	49
Reliability	49
Using Information to Categorize Customers	49
Stages in Service Firm Competitiveness	50
Available for Service	50
Journeyman	50
Distinctive Competence Achieved	50
World-Class Service Delivery	52
Service Benchmark: Outside the Box	52
Summary	52
Key Terms and Definitions	53
Topics for Discussion	53
Interactive Exercise	54
CASE 2.1: United Commercial Bank and El Banco	54
CASE 2.2: The Alamo Drafthouse	56
Selected Bibliography	58
Endnotes	59

**PART TWO****DESIGNING THE SERVICE ENTERPRISE 61****Chapter 3****New Service Development 63**

Learning Objectives 63

Chapter Preview 64

Sources of Service Sector Growth 64

*Information Technology* 64*The Internet as a Service Enabler* 65*Innovation* 66*Changing Demographics* 66

Innovation in Services 67

*Challenges of Adopting New Technology in Services* 70*Readiness to Embrace New Technology* 70

New Service Development 70

*Service Design Elements* 72

Strategic Positioning through Process

*Structure* 73

Service Blueprinting 74

Taxonomy for Service Process Design 76

*Degree of Divergence* 77*Object of the Service Process* 77*Type of Customer Contact* 77

Generic Approaches to Service System Design 78

*Production-Line Approach* 79*Customer as Coproducer* 80*Customer Contact Approach* 81*Information Empowerment* 83

Intellectual Property 84

Service Benchmark: Ten Things Google

*Has Found To Be True* 85

Summary 85

Key Terms and Definitions 86

Topics for Discussion 86

Interactive Exercise 86

CASE 3.1: 100 Yen Sushi House 86

CASE 3.2: Commuter Cleaning—A New Venture

*Proposal* 87

CASE 3.3: Amazon.com 89

Selected Bibliography 92

Endnotes 92

**Chapter 4****The Service Encounter 95**

Learning Objectives 95

Chapter Preview 95

Technology in the Service Encounter 96

The Emergence of Self-Service 97

The Service Encounter Triad 98

*Encounter Dominated by the Service Organization* 99*Contact Personnel-Dominated Encounter* 99*Customer-Dominated Encounter* 99**The Service Organization 100***Culture* 100*Empowerment* 101*Control Systems* 102*Customer Relationship Management* 102

Contact Personnel 103

*Selection* 103*Training* 104*Creating an Ethical Climate* 105

The Customer 106

*Expectations and Attitudes* 106*The Role of Scripts in Coproduction* 107

Creating a Customer Service Orientation 108

Service Profit Chain 109

Service Benchmark: Miss Manners on Complaint

*Handling* 111

Summary 111

Key Terms and Definitions 112

Topics for Discussion 112

Interactive Exercise 112

CASE 4.1: Amy's Ice Cream 112

CASE 4.2: Enterprise Rent-A-Car 113

Selected Bibliography 116

Endnotes 117

**Chapter 5****Supporting Facility and Process Flows 119**

Learning Objectives 119

Chapter Preview 120

Environmental Psychology and Orientation 120

Servicescapes 120

*Behaviors in Servicescapes* 121*Environmental Dimensions of Servicescapes* 122

Facility Design 124

*Nature and Objectives of Service Organizations* 124*Land Availability and Space Requirements* 125*Flexibility* 125*Security* 125*Aesthetic Factors* 126*The Community and Environment* 126

Process Analysis 127

*Types of Processes* 127*Flowcharting* 127*Gantt Chart* 128*Process Terminology* 129

Facility Layout 131

*Flow Process Layout and the Work Allocation Problem* 131*Job Shop Process Layout and the Relative Location**Problem* 133

Summary 136

Service Benchmark: Where, Oh Where Shall We Go? 137

Key Terms and Definitions 137

Topics for Discussion 138

Interactive Exercise 138



Solved Problems	138
Exercises	140
CASE 5.1: Health Maintenance Organization (A)	143
CASE 5.2: Health Maintenance Organization (B)	144
CASE 5.3: Esquire Department Store	144
CASE 5.4: Central Market	145
Selected Bibliography	147
Endnotes	147

## Chapter 6

### Service Quality 149

Learning Objectives	149
Chapter Preview	149
Defining Service Quality	150
<i>Dimensions of Service Quality</i>	150
<i>Gaps in Service Quality</i>	151
Measuring Service Quality	153
SERVQUAL	153
Walk-through Audit	154
Quality Service by Design	158
<i>Incorporation of Quality in the Service Package</i>	158
Taguchi Methods	159
Poka-Yoke (Failsafing)	160
Quality Function Deployment	161
Achieving Service Quality	163
Cost of Quality	163
Statistical Process Control	164
Unconditional Service Guarantee	168
Stages in Quality Development	170
Service Recovery	170
Approaches to Service Recovery	172
Complaint Handling Policy	173
Service Benchmark: Bronson Methodist Hospital	173
Summary	174
Key Terms and Definitions	174
Topics for Discussion	174
Interactive Exercise	175
Solved Problems	175
Exercises	176
CASE 6.1: Clean Sweep, Inc.	179
CASE 6.2: The Complaint Letter	180
CASE 6.3: The Helsinki Museum of Art and Design	182
Selected Bibliography	183
Endnotes	185

## Chapter 7

### Process Improvement 187

Learning Objectives	187
Chapter Preview	187
Quality and Productivity Improvement Process	188
<i>Foundations of Continuous Improvement</i>	188
Plan-Do-Check-Act (PDCA) Cycle	188
Problem Solving	189

### Quality Tools for Analysis and Problem Solving 190

Check Sheet	190
Run Chart	190
Histogram	190
Pareto Chart	191
Flowchart	191
Cause-and-Effect Diagram	192
Scatter Diagram	193
Control Chart	193
Benchmarking	194
Improvement Programs	195
Deming's 14-Point Program	195
ISO 9001	196
Six Sigma	196
Lean Service	200
Service Benchmark: When Something Doesn't Work—Sometimes Just Hit it with a Hammer!	203
Summary	203
Key Terms and Definitions	204
Topics for Discussion	204
Interactive Exercise	204
CASE 7.1: Sonora County Sheriff	204
CASE 7.2: Mega Bytes Restaurant	205
Chapter 7 Supplement: Data Envelopment Analysis (DEA)	209
Measuring Service Productivity	209
The DEA Model	209
DEA and Strategic Planning	215
Exercises	216
CASE 7.3: Mid-Atlantic Bus Lines	216
Selected Bibliography	217
Endnotes	218

## Chapter 8

### Service Facility Location 219

Learning Objectives	219
Chapter Preview	219
Strategic Location Considerations	220
Competitive Clustering	220
Saturation Marketing	220
Marketing Intermediaries	221
Substitution of Communication for Travel	221
Separation of Front from Back Office	222
Impact of the Internet on Service Location	222
Site Considerations	223
Geographic Information Systems	223
Facility Location Modeling Considerations	225
Geographic Representation	225
Number of Facilities	227
Optimization Criteria	227
Facility Location Techniques	229
Cross-Median Approach for a Single Facility	230
Huff Model for a Retail Outlet	232
Location Set Covering for Multiple Facilities	234



Regression Analysis in Location Decisions	235
Summary	236
Service Benchmark: Here a Bun, There a Bun, Everywhere a Bun-Bun	237
Key Terms and Definitions	237
Topics for Discussion	238
Interactive Exercise	238
Solved Problems	238
Exercises	240
CASE 8.1: Health Maintenance Organization (C)	242
CASE 8.2: Athol Furniture, Inc.	242
Selected Bibliography	245
Endnotes	245

## PART THREE

### MANAGING SERVICE OPERATIONS 247

#### Chapter 9

##### Service Supply Relationships 249

Learning Objectives	249
Chapter Preview	249
Supply Chain Management	250
Network Model	250
Managing Uncertainty	251
Omnichannel Supply Chain	251
Service Supply Relationships	253
Customer-Supplier Duality	253
Service Supply Relationships Are Hubs, Not Chains	254
Managing Service Relationships	254
Bidirectional Optimization	255
Productive Capacity	256
Perishability	256
Social Media in Services	257
Social Media as a Competitive Strategy	258
Social Media and Customer Convenience	258
Social Media for Organizing and Co-creation of Value	259
Professional Service Firms	259
Attributes of Professional Services	259
Service Consulting	260
Operational Characteristics	261
Outsourcing Services	263
Benefits and Risks of Outsourcing Services	264
Classification of Business Services	265
Managerial Considerations with Service Outsourcing	266
Summary	268
Service Benchmark: Citizens Come First in Lynchburg	269
Key Terms and Definitions	269
Topics for Discussion	269
Interactive Exercise	270
CASE 9.1: Boomer Consulting, Inc.	270
CASE 9.2: Evolution of B2C E-Commerce in Japan	272
CASE 9.3: Mortgage Service Game	274
Selected Bibliography	276
Endnotes	276

#### Chapter 10

##### Globalization of Services 279

Learning Objectives	279
Chapter Preview	280
Domestic Growth and Expansion Strategies	280
Focused Service	280
Focused Network	281
Clustered Service	281
Diversified Network	282
Franchising	282
The Nature of Franchising	283
Benefits to the Franchisee	283
Issues for the Franchiser	284
Globalization of Services	285
Generic International Strategies	285
The Nature of the Borderless World	287
Planning Transnational Operations	288
Global Service Strategies	290
Multicountry Expansion	291
Importing Customers	292
Following Your Customers	292
Service Offshoring	293
Beating the Clock	293
Service Benchmark: Small World and Other Myths	294
Summary	294
Key Terms and Definitions	295
Topics for Discussion	295
Interactive Exercise	295
CASE 10.1: Goodwill Industries of Central Texas	295
CASE 10.2: FedEx: Tiger International Acquisition	297
Selected Bibliography	300
Endnotes	300

#### Chapter 11

##### Managing Capacity and Demand 301

Learning Objectives	301
Chapter Preview	301
Generic Strategies of Level Capacity or Chase Demand	302
Strategies for Managing Demand	302
Customer-Induced Variability	302
Segmenting Demand	303
Offering Price Incentives	304
Promoting Off-Peak Demand	305
Developing Complementary Services	306
Reservation Systems and Overbooking	306
Strategies for Managing Capacity	308
Defining Service Capacity	308
Daily Workshift Scheduling	309
Weekly Workshift Scheduling with Days-Off Constraint	311
Increasing Customer Participation	312
Creating Adjustable Capacity	313
Sharing Capacity	313



Cross-Training Employees	313
Using Part-Time Employees	313
Yield Management	315
Yield Management Applications	319
Service Benchmark: Pay Up Front and Take Your Chances	320
Summary	320
Key Terms and Definitions	321
Topics for Discussion	321
Interactive Exercise	321
Solved Problems	321
Exercises	323
CASE 11.1: River City National Bank	325
CASE 11.2: Gateway International Airport	327
CASE 11.3: The Yield Management Analyst	328
CASE 11.4: Sequoia Airlines	331
Selected Bibliography	332
Endnotes	333

## Chapter 12

### Managing Waiting Lines 335

Learning Objectives	335
Chapter Preview	335
The Economics of Waiting	336
Queuing Systems	336
Strategies for Managing Customer Waiting	337
<i>The Psychology of Waiting</i>	337
<i>That Old Empty Feeling</i>	338
<i>A Foot in the Door</i>	338
<i>The Light at the End of the Tunnel</i>	339
<i>Excuse Me, but I Was Next</i>	340
Essential Features of Queuing Systems	340
<i>Calling Population</i>	341
<i>Arrival Process</i>	342
<i>Queue Configuration</i>	345
<i>Queue Discipline</i>	346
<i>Service Process</i>	349

Summary	350
Service Benchmark: The Magic of Disney Makes Queues Disappear	351
Key Terms and Definitions	351
Topics for Discussion	351
Interactive Exercise	351
Solved Problem	351
Exercises	352
CASE 12.1: Thrifty Car Rental	352
CASE 12.2: Eye'll Be Seeing You	353
CASE 12.3: Field Study	354
Selected Bibliography	354
Endnotes	355

## Chapter 13

### Capacity Planning and Queuing Models 357

Learning Objectives	357
Chapter Preview	358

Capacity Planning	358
<i>Strategic Role of Capacity Decisions</i>	359
Analytical Queuing Models	360
<i>Relationships among System Characteristics</i>	362
<i>Standard M/M/1 Model</i>	362
<i>Standard M/M/c Model</i>	364
<i>M/G/1 Model</i>	367
<i>General Self-Service M/G/∞ Model</i>	368
<i>Finite-Queue M/M/1 Model</i>	368
<i>Finite-Queue M/M/c Model</i>	369
Capacity Planning Criteria	370
<i>Average Customer Waiting Time</i>	370
<i>Probability of Excessive Waiting</i>	371
<i>Minimizing the Sum of Customer Waiting Costs and Service Costs</i>	372
<i>Probability of Sales Lost Because of Inadequate Waiting Area</i>	373
Service Benchmark: Don't Guesstimate, Simulate!	374
Summary	375
Key Terms and Definitions	375
Topics for Discussion	375
Interactive Exercise	375
Solved Problems	375
Exercises	377
CASE 13.1: Houston Port Authority	380
CASE 13.2: Freedom Express	380
CASE 13.3: Renaissance Clinic (A)	381
Chapter 13 Supplement: Computer Simulation	382
Systems Simulation	382
<i>Simulation Methodology</i>	383
<i>Monte Carlo Simulation</i>	384
<i>Generating Random Variables</i>	384
<i>Discrete Random Variable</i>	385
<i>Continuous Random Variable</i>	386
<i>Discrete-Event Simulation</i>	387
Process Simulator by ProModel	389
Solved Problems	391
Exercises	394
CASE 13.4: Drivers License Renewal	397
CASE 13.5: Renaissance Clinic (B)	398
Selected Bibliography	398
Endnotes	399

## PART FOUR

### Quantitative Models for Service Management 401

## Chapter 14

### Forecasting Demand for Services 403

Learning Objectives	403
Chapter Preview	403
The Choice of Forecasting Method	404
Subjective Models	404
<i>Delphi Method</i>	405
<i>Cross-Impact Analysis</i>	406
<i>Historical Analogy</i>	406



Causal Models	407
Regression Models	407
Econometric Models	408
Time Series Models	408
N-Period Moving Average	408
Simple Exponential Smoothing	409
Forecast Error	411
Relationship Between $\alpha$ and $N$	412
Exponential Smoothing with Trend Adjustment	413
Exponential Smoothing with Seasonal Adjustment	414
Exponential Smoothing with Trend and Seasonal Adjustments	416
Summary of Exponential Smoothing	418
Summary	418
Service Benchmark: Googling the Future	419
Key Terms and Definitions	419
Topics for Discussion	419
Interactive Exercise	420
Solved Problems	420
Exercises	422
CASE 14.1: Oak Hollow Medical Evaluation Center	423
CASE 14.2: Gnomial Functions, Inc.	424
Selected Bibliography	425
Endnotes	426

## Chapter 15

### Managing Service Inventory 427

Learning Objectives	427
Chapter Preview	428
Inventory Theory	429
Role of Inventory in Services	429
Characteristics of Inventory Systems	430
Relevant Costs of an Inventory System	431
Order Quantity Models	432
Economic Order Quantity	433
Inventory Model with Quantity Discounts	435
Inventory Model with Planned Shortages	437
Inventory Management under Uncertainty	440
Inventory Control Systems	441
Continuous Review System	441
Periodic Review System	442
The ABCs of Inventory Control	444
Radio Frequency Identification	445
Single-Period Model for Perishable Goods	446
Expected Value Analysis	446
Marginal Analysis	447
Retail Discounting Model	448
Service Benchmark: Your Bag Is Tagged	450
Summary	450
Key Terms and Definitions	450
Topics for Discussion	451
Interactive Exercise	451
Solved Problems	451
Exercises	453
CASE 15.1: A.D. Small Consulting	458
CASE 15.2: Last Resort Restaurant	458

CASE 15.3: Elysian Cycles	459
Selected Bibliography	460
Endnotes	460

## Chapter 16

### Managing Service Projects 461

Learning Objectives	461
Chapter Preview	461
The Nature of Project Management	462
Characteristics of Projects	462
Project Management Process	462
Selecting the Project Manager	463
Building the Project Team	463
Principles of Effective Project Management	464
Techniques for Project Management	464
Gantt Project Charts	464
A Critique of Gantt Charts	466
Constructing a Project Network	466
Critical Path Method	467
Microsoft Project Analysis	470
Resource Constraints	473
Activity Crashing	473
Incorporating Uncertainty in Activity Times	478
Estimating Activity Duration Distributions	478
Project Completion Time Distribution	479
A Critique of the Project Completion Time Analysis	480
Problems with Implementing Critical Path Analysis	482
Monitoring Projects	482
Earned Value Chart	483
Project Termination	483
Project History Report	484
Service Benchmark: The House That Warren Built	484
Summary	484
Key Terms and Definitions	485
Topics for Discussion	485
Interactive Exercise	485
Solved Problems	485
Exercises	487
CASE 16.1: Info-Systems, Inc.	491
CASE 16.2: Whittier County Hospital	492
Selected Bibliography	494
Endnote	494

### Appendix A: Areas of Standard Normal Distribution 495

### Appendix B: Uniformly Distributed Random Numbers [0, 1] 496

### Appendix C: Values of $L_q$ for the $M/M/c$ Queuing Model 497

### Appendix D: Equations for Selected Queuing Models 499

### Name Index 505

### Subject Index 509





# connect®

## Why Connect?

You want to achieve the best grades possible with the limited time you have to study. McGraw-Hill Connect helps you do just that.

Connect is your personalized digital learning assistant that makes earning better grades and managing time easier, quicker and more convenient than ever.



### The early bird gets the grade.\*

Activate your Connect subscription now!  
Students who access Connect sooner do better.

**11%** – Average increase in student scores  
when you learn with Connect day 1 vs. day 14 of class

**85%** of students pass using Connect  
compared to **72%** of students not using Connect

\*Source: The Impact of Connect on Student Success. McGraw-Hill Connect® Effectiveness Study 2016

**connect.mheducation.com**



Cover Images:  
Top left © wavebreakmediamicro/123RF  
Top center © KidStock/Blend Images LLC  
Top right © Shutterstock / Monkey Business Images  
Bottom © geopaul/Getty Images

