Contents

Preface viii

PART I INTRODUCTION TO UNDERSTANDING BUSINESS ANALYTICS 1

Chapter 1 What Is Business Intelligence, Analytics, and Artificial Intelligence? 1

The Evolution of Business Intelligence, Analytics, and Artificial Intelligence 1
Analytics versus Transactional Systems 3
Further Exploring Analytics 3
The Analytics Applications "Stack" 4
Summing It Up 4
Questions 5
References and Further Reading 5

Chapter 2 The Skills Needed for Analytics 6

The Demand for Analytics Producers 6
Is Analytics for You? 6
The Three Skills Needed for Analytics 7
The Varying Skills Analytics Consumers and Producers Need 7
Additional People Involved in Analytics 9
Organizing for Analytics 10
The Solutions Delivery Team at Equifax 11
Summing It Up 11
Questions 12
References and Further Reading 12

Chapter 3 Supporting Business Strategies with Analytics 13

Market Disruption 13
Business Strategies 14
Different Targets for Analytics 14
A Market Necessity: Amazon.com and Overstock.com 15
Seizing an Opportunity: Harrah's 15
Responding to a Problem: First American Corporation 16
The Payoff from Analytics 16
Summing It Up 16
Questions 17
References and Further Reading 17

Chapter 4 Enduring Keys to Analytics Success 18

Project Success Factors 18
Application Development Success 20
The Simplicity/Flexibility Trade-Off 23
Questions 24
References and Further Reading 24
Assignment 24
Questions 25

Part I Cases 26

Case 1 Organizing for Customer-Facing Analytics at Equifax 26
Case 2 Harrah's High Payoff from Customer Information 30
Case 3 Data Warehousing Supports Corporate Strategy at First American Corporation 36
Case 4 Analytics at RetailStore.com 48

PART II DESCRIPTIVE ANALYTICS 57

Chapter 5 Decision Support Systems 57

DSS Defined 57
DSS Characteristics 57
The DSS Reference Architecture 58
Institutional and Ad Hoc DSS 60
DSS Examples 60
The Continuing Evolution of Decision Support 62
Questions 62
References and Further Reading 62

Chapter 6 "Slicing and Dicing" Data with OLAP 63

Online Analytical Processing 63
OLAP for New Car Sales 63
OLAP Is Everywhere and Is Powerful 65
Behind the Curtain 65
OLAP Data Management 65
Performance Is Critical 66
Questions 67
References and Further Reading 67

Chapter 7 Meeting the Information Needs of Executives 68

Illustrating the Possible Information in an EIS 69
An EIS Screen 70
The EIS at the World Bank 71
Summing It Up 76
Questions 76
References and Further Reading 76

Chapter 8 Analytics Portal Provides a Window for Accessing Information 77

About Mozilla 77
The Business Need 77
The Approach Taken 78
Moving Forward 78
The Analytics Portal's Contents 78
Data Quality and Governance 80
Next Steps 81
Keys to Success 81
Why the Portal Is Successful 82
Questions 82
References and Further Reading 82

Chapter 9 Selecting the Best Visualizations 83

A Brief History of Data and Information Visualization 83
The Power of Visualizations 84
Preattentive Attributes 84
Different Kinds of Visualizations 85
Data and Information Visualization Software 94
Summing It Up 94
Questions 94
References and Further Reading 95

Chapter 10 Data and Information Visualization, Data Interpreters, and Storytelling 96

Visualization: Information versus Data 96
Two Stories 96
The Takeaways 97
What Research Tells Us 97
The Data Interpreter 98
Storytelling 98
Summing It Up 99
Questions 99
References and Further Reading 99

Chapter 11 Dashboards and Scorecards to Monitor, Evaluate, and Motivate Performance 100

What Is a Dashboard? 101
Why Dashboards Are Built 101
Building Dashboards 101
Who Builds Dashboards 103
Determining Dashboard Information Requirements 103
Choosing the Right Performance Metrics 103
Designing Effective Dashboards 104
Advanced Dashboard Capabilities 105
Scorecards 106
Strategy Maps 107
Top-Down versus Bottom-Up Development 107
Questions 108
References and Further Reading 108
Assignment 108

Chapter 12 Data Literacy Is Self-Service Analytics' Missing Link 109

The Long Path 109
Data Literacy 110
The Last Mile 111
Self-Service Artificial Intelligence 112
Summing It Up 112
Questions 112
References and Further Reading 112

Part II Cases and Software Projects 113

Case 5 How Metrics Motivate at 1-800 CONTACTS 113
Case 6 Piedmont Healthcare's Dashboards Deliver Information 117
Software Project 1 CountThings DSS 120
Software Project 2 Tableau Problem Identification 126
Software Project 3 Tableau Interactive Dashboard 128

PART III CREATING THE ANALYTICS TECHNOLOGY INFRASTRUCTURE 129

Chapter 13 Selecting Analytics Software 129

Tools and Platforms 129
BI and Analytics Platforms 129
Commercial and Open-Source Software 130
Small and Big Fish 130
Excel 131
The Need to Control Software Proliferation 131
AI Is a Game Changer 132
The Analytics Software Selection Process 132
Questions 136
References and Further Reading 136

Chapter 14 Data Marts and Warehouses Provide a "Single Version of the Truth" 137

Data Marts, Warehouses, and Warehousing 137
Getting Started 139
Data Extraction, Transformation, and Loading 139
Metadata 143
Data Warehouse Architectures 144
Data Warehousing in the Cloud 145
Data Marts and Warehouse Users 146
Data Warehousing at Owens & Minor 146
Questions 147
References and Further Reading 147

Chapter 15 Creating the Big Data Infrastructure 148

What Is Big Data? 148
Big Data Sources 149
Big Data Analytics 149
Examples of Big Data Analytics 149
The Benefits of Big Data Analytics 151
The Requirements for Being Successful with Big Data Analytics 151
A Strong Data Infrastructure 151
The Data Warehouse Is Not Dead 158
Which Platform Is Best? 159
Integrating the Various Platforms 159
A Contemporary Analytics Reference Architecture 159
A Data Mesh 160
A Data Fabric 160
Questions 161
References and Further Reading 161

Part III Cases 163

Case 7 Continental Airlines Flies High with Real-Time Business Intelligence 163
Case 8 U.S. Xpress: Where Trucks and BI Hit the Road 171

PART IV ANALYTICS PROJECT LIFE CYCLE 175

Chapter 16 ROI and Getting Analytics Projects Approved 175

ROI Can Mean Different Things 175
Addressing the "Organizational Pain" 175
Preparing the Proposal 176
Pre- and Postimplementation 177
Assessing the Benefits and Costs 177
Make the Benefits Believable 177
Considerations for Getting Analytics Projects Approved 177
Questions 178
References and Further Reading 178

Chapter 17 Analytics Project Success Is in the Eye of the Beholder 179

A Research Study 179
Expectations 179
Client/Contractor Relationship 180
Sponsor Commitment 180
Politics 181
Project Fatigue 181
Summing It Up 181
Questions 182
References and Further Reading 182

Chapter 18 A Deep Dive into the Analytics Life Cycle 183

Members of the Analytics Team 183
The Analytics Life Cycle 184
Summing It Up 188
Questions 189
References and Further Reading 189

PART V PREDICTIVE ANALYTICS 191

Chapter 19 Predictive Modeling for Supporting Decision-Making and Improving Organizational Performance 191

Predictive Analytics Is Different from OLAP 191
Diapers and Beer 192
Different Approaches to Predictive Analytics 192
Common Kinds of Information Generated by Predictive Analytics 193
How the IRS Decides Who to Audit 194
Questions 195
References and Further Reading 195

Chapter 20 The CRISP-DM Methodology for Building Predictive Models 196

Business Understanding 196
Data Understanding 197
Data Preparation 197
Modeling 198
Final Evaluation 203
Deployment 204
Questions 205
References and Further Reading 205

Chapter 21 Finding Patterns and Relationships with Machine Learning 206

Understanding Machine Learning 206
Neural Networks and Deep Learning Are Difficult to Understand 209
Neural Networks 209
Predicting Machine Failures at NCR 210
How They Are Trained 210
Deep Learning 212
From a Cottage Industry to a Factory Approach 212
The MLOps Approach 214
MLOps Steps 215
Questions 216
References and Further Reading 216

Part V Software Project 217

Software Project 4 BigML Predictive Modeling 217

PART VI ARTIFICIAL INTELLIGENCE 219

Chapter 22 Artificial Intelligence and Its Applications 219

The History of AI 219
Natural Language Interfaces 221
Chatbots 221
Visualization Systems 222
Robots 222
Robot Process Automation 224
Self-Driving Vehicles 224
Software Agents and Virtual Assistants 225
Infusion of AI into Analytics Tools and Platforms 227
Expert Systems 228
The Future of AI 232
Questions 234
Assignment 234
References and Further Reading 235

Chapter 23 Using and Building Generative AI Applications 236

The Major Players 236
What Is Generative AI? 237
A Reference Architecture for Generative AI 237
Creating Effective Prompts 241
Advantages and Disadvantages of Generative AI 245
Generative AI Uses 246
Responding to Customer Complaints 246
Summing It Up 247
Questions 247
References and Further Reading 248

Chapter 24 Managing Artificial Intelligence 249

A Maturity Model Perspective of Decision Support 249
The AI Generation of Decision Support 250
Recommendations for Preparing for the AI Generation 251
AI Is Entering through the "Front and Back Doors" 251
Questions 258
References and Further Reading 258

PART VII PRESCRIPTIVE ANALYTICS 259

Chapter 25 Monte Carlo Simulation 259

Three Kinds of Decision-Making 259
Deterministic and Probabilistic Methods of Analysis 260
Basic Inventory Concepts 260
A Fixed-Order Quantity Model 261
A Monte Carlo Inventory Simulation 263
Questions 269
References and Further Reading 270

Chapter 26 Optimization Using Linear Programming 271

Formulating a Problem Mathematically 271
Solving Linear Programming Problems Using the Graphical Method 275
Possible Multiple Solutions or No Solutions 280
Integral Solutions 280
Limitations of the Graphical Method 280
The Simplex Method 280
Online Simplex Method and Excel Add-In 280
Questions 281
References and Further Reading 283

PART VIII BUSINESS INTELLIGENCE, ANALYTICS, AND AI GOVERNANCE 285

Chapter 27 Getting Started with Business-Driven Data Governance 285

What Is Data Governance? 285
A Business-Driven Starting Point 285
Identify the Core Problem 287
Taking Responsibility 287
Top Down and Bottom Up in Concert 287
A Journey Rather Than a Destination 287
Organizing for Data Governance 288
Rules of the Road 288
Summing It Up 289
Questions 289
References and Further Reading 289

Chapter 28 Avoid Being Creepy in the Use of Personal Data and Algorithms 290

The Creepiness Scale 290
ACM Recommended Principles 291
Best Practices 291
Summing It Up 294
Questions 294
Assignment 295
References and Further Reading 295

PART IX CAREERS IN ANALYTICS 297

Chapter 29 Career Opportunities in Analytics 297

Starting Your Professional Career 297
Becoming an Analytics Director 300
Starting an Analytics Consulting Firm 303
Questions 305
References and Further Reading 306

Index 307

Additional Acknowledgments 316