



Ninth Edition

# INFORMATION TECHNOLOGY FOR MANAGEMENT

Advancing Sustainable, Profitable Business Growth

**EFRAIM TURBAN • LINDA VOLONINO • GREGORY WOOD**





9<sup>th</sup>  
Edition

# Information Technology for Management

Advancing Sustainable, Profitable  
Business Growth

This page is intentionally left blank

**9**<sup>th</sup>  
Edition

# Information Technology for Management

Advancing Sustainable, Profitable  
Business Growth

**EFRAIM TURBAN**

**LINDA VOLONINO**, Canisius College

**GREGORY R. WOOD**, Canisius College

contributing author:

**JANICE C. SIPIOR**, Villanova University

**WILEY**

VP & EXECUTIVE PUBLISHER:	Don Fowley
EXECUTIVE EDITOR:	Beth Lang Golub
ASSISTANT EDITOR:	Katherine Willis
MARKETING MANAGER:	Christopher Ruel
MARKETING ASSISTANT:	Ashley Tomeck
PHOTO EDITOR:	Lisa Gee
DESIGNER:	Kenji Ngieng
SENIOR PRODUCTION MANAGER:	Janis Soo
ASSOCIATE PRODUCTION MANAGER:	Joyce Poh

This book was set by Aptara, Inc. Cover and text printed and bound by Courier Kendallville.

This book is printed on acid free paper.

Founded in 1807, John Wiley & Sons, Inc. has been a valued source of knowledge and understanding for more than 200 years, helping people around the world meet their needs and fulfill their aspirations. Our company is built on a foundation of principles that include responsibility to the communities we serve and where we live and work. In 2008, we launched a Corporate Citizenship Initiative, a global effort to address the environmental, social, economic, and ethical challenges we face in our business. Among the issues we are addressing are carbon impact, paper specifications and procurement, ethical conduct within our business and among our vendors, and community and charitable support. For more information, please visit our website: [www.wiley.com/go/citizenship](http://www.wiley.com/go/citizenship).

Copyright © 2013, 2011, 2010 John Wiley & Sons, Inc. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc. 222 Rosewood Drive, Danvers, MA 01923, website [www.copyright.com](http://www.copyright.com). Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030-5774, (201)748-6011, fax (201)748-6008, website <http://www.wiley.com/go/permissions>.

Evaluation copies are provided to qualified academics and professionals for review purposes only, for use in their courses during the next academic year. These copies are licensed and may not be sold or transferred to a third party. Upon completion of the review period, please return the evaluation copy to Wiley. Return instructions and a free of charge return mailing label are available at [www.wiley.com/go/returnlabel](http://www.wiley.com/go/returnlabel). If you have chosen to adopt this textbook for use in your course, please accept this book as your complimentary desk copy. Outside of the United States, please contact your local sales representative.

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

# BRIEF CONTENTS

## Part I

Maximizing the Value of  
Data and Information  
Technology

- 1 A Look Toward the Future of Information Technology 1
- 2 Information Management and IT Architecture 28
- 3 Database, Data Warehouse, and Data Mining 56
- 4 Networks, Collaboration, and Sustainability 85
- 5 CyberSecurity, Compliance, and Business Continuity 112

## Part II

Digital, Mobile and  
Social Commerce

- 6 E-Business & E-Commerce Models and Strategies 145
- 7 Mobile Technologies and Commerce 191
- 8 Web 2.0 and Social Media 225

## Part III

Enterprise Systems and  
Analytics

- 9 Functional Area and Compliance Systems 269
- 10 Enterprise Systems and Applications 301
- 11 Performance Management using Data Visualization, Mashups, and Mobile Intelligence 333

## Part IV

IT Planning, Strategy,  
and Ethics

- 12 IT Strategy, Sourcing, and Vendor Relationships 355
- 13 Business Process and Project Management 387
- 14 IT Ethics and Responsible Conduct 418

**Glossary** G-1

**Organizational Index** O-1

**Name Index** N-1

**Subject Index** S-1



This page is intentionally left blank



# CONTENTS

## Part I

### Maximizing the Value of Data and Information Technology

#### 1 A Look Toward the Future of Information Technology 1

*Case #1, Opening Case: Need Start-up Cash? Try Crowdfunding at Kickstarter.com* 2

1.1 IT and Management Opportunities and Challenges 4

1.2 Top Management Concerns and Influential ITs 7

1.3 IT Agility, Consumerization, and Competitive Advantage 13

1.4 Strategic Planning and Competitive Models 15

1.5 Why IT is Important to Your Career, and IT Careers 20

*Case #2, Business Case: Building a Sustainable Big City with a Competitive Edge* 25

*Case #3, Video Case, Public Sector: ACCESS NYC—IT Strategy and Transformation* 26

*Data Analysis & Decision Making: Evaluating Cost-Savings from Switching to the Cloud* 26

#### 2 Information Management and IT Architecture 28

*Case #1, Opening Case: Paul McCartney's Artistic Legacy (and its IT architecture)* 29

2.1 Information Management in the 2010s 32

2.2 IT Architecture 36

2.3 Information Systems and IT Infrastructure 38

2.4 Cloud Computing and Services 47

2.5 Virtualization and VM (Virtual Machines) 50

*Case #2, Business Case: Online Gamers' Statistics Stored in the Cloud* 54

*Case #3, Video Case: Three Cloud Computing Case Studies* 54

*Data Analysis & Decision Making: DSS to Control and Manage Gasoline Costs* 55

#### 3 Database, Data Warehouse, and Data Mining 56

*Case #1, Opening Case: Zero-Downtime at BNP Paribas* 57

3.1 Database Technology 60

3.2 Data Warehouse and Data Mart Technologies 69

3.3 Data and Text Mining 72

3.4 Business Intelligence (BI) and Analytics 75

3.5 Digital and Physical Document Management 78

*Case #2, Business Case: Global Defense Contractor Gains Competitive Edge with Analytics* 82

*Case #3, Video Case: Privacy vs. Convenience: How We Enable Data Mining* 82

*Data Analysis & Decision Making: Calculating Document Management Costs* 83

#### 4 Networks, Collaboration, and Sustainability 85

*Case #1, Opening Case: Mobile Network Gives Haneda Airport Its Competitive Edge* 86

4.1 Business IT Networks and Components 88

4.2 Wireless Network Applications and Mobile Infrastructure 93

4.3 Network Management and Search 96

4.4 Collaboration and Communication Technologies 102

4.5 Sustainability and Ethical Issues 104

*Case #2, Business Case: Avoiding a Future of Crippling Car Congestion* 109

*Case #3, Video Case: Advocate Health Care achieves Fast ROI with Business Video* 110

*Data Analysis & Decision Making: Cost Comparison of Web Conferencing* 110

#### 5 CyberSecurity, Compliance, and Business Continuity 112

*Case #1, Opening Case: Managing BYOD Security Risks* 113

5.1 Up Close Look at Cybercrimes, Criminals, and Motivations 116

5.2 IT Vulnerabilities and Threats 122

5.3 Defending Against Fraud 130

5.4 Information Assurance and Risk Management 131

5.5 Network Security 134

5.6 Internal Control and Compliance 137

5.7 Business Continuity and Auditing 139

*Case #2, Business Case: Army Deploys Androids, Securely* 143

*Case #3, Video Case: Cars, Appliances Could Be Hack Targets* 143

*Data Analysis & Decision Making: Financial Impact of Breached Protected Health Information* 144

## Part II

### Digital, Mobile and Social Commerce

#### 6 E-Business & E-Commerce Models and Strategies 145

*Case #1, Opening Case: The Google Universe* 147

6.1 E-Business Challenges and Strategies 156

6.2 Business to Consumer (B2C) E-Commerce 166

6.3 Business to Business (B2B) E-Commerce and E-Procurement 169

6.4 E-Government and Public Sector IT Trends 172

6.5 E-Commerce Support Services and Digital Marketing Communications 174

- 6.6 E-Business Ethics and Legal Issues 182
  - Case #2, E-Government: Increasing Productivity and Efficiency with Cloud and Mobile Technologies 187
  - Case #3, Video Case: Finding Your Dream Home in the Age of E-Commerce 188
  - Data Analysis & Decision Making: Creating Visualizations Using Public Online Datasets 189

## 7 Mobile Technologies and Commerce 191

- Case #1, Opening Case: Macy's Races Ahead with Mobile Retail Strategies 192
- 7.1 Mobile Computing Technology 194
- 7.2 Mobile Commerce 199
- 7.3 Mobile Transactions and Financial Services 206
- 7.4 Location-Based Services and Commerce 210
- 7.5 Mobile Enterprise Applications 214
  - Case #2, Business Case: Mobile eTextbooks with Chegg.com 220
  - Case #3, Video Case: Future Tech: Searching with Pictures using MVS 221
  - Data Analysis & Decision Making: Estimating Financial Benefits of Increased Customer Loyalty 222

## 8 Web 2.0 and Social Media 225

- Case #1, Opening Case: Organizations WOW Customers with Social Customer Service 226
- 8.1 Web 2.0 and Social Media 229
- 8.2 Virtual Communities and Social Networking Services 237
- 8.3 Enterprise 2.0—Social Networks and Tools for Business 245
- 8.4 Social Media Metrics 250
- 8.5 The Future: Web 3.0 256
  - Case #2, Business Case: Is Google+ a Better Social Network? 264
  - Case #3, Video Case: Creating Customer Engagement for Danone Activia 265
  - Data Analysis & Decision Making: Estimating the Value of Social Media 266

## Part III Enterprise Systems and Analytics

### 9 Functional Area and Compliance Systems 269

- Case #1, Opening Case: International Speedway Gets Lean 270
- 9.1 Management Levels and Functional Systems 272
- 9.2 Manufacturing, Production, and Transportation Systems 276
- 9.3 Sales and Marketing Systems 282
- 9.4 Accounting, Finance, and Compliance Systems 285
- 9.5 Human Resources Systems, Compliance, and Ethics 292
  - Case #2, Business Case: Station Casinos' Loyalty Program 298
  - Case #3, Video Case: Superior Manufacturing Wipes the Competition 299

Data Analysis & Decision Making: SunWest Foods' Improved Bottom Line 299

### 10 Enterprise Systems and Applications 301

- Case #1, Opening Case: Managing the U.S. Munitions Supply Chain 302
- 10.1 Enterprise Systems 304
- 10.2 Enterprise Resource Planning (ERP) Systems 307
- 10.3 Supply Chain Management (SCM) Systems 315
- 10.4 Collaborative Planning, Forecasting, and Replenishment (CPFR) Systems 320
- 10.5 Customer Relationship Management (CRM) Systems 324
  - Case #2, Business Case: Supply Chain Collaboration in the Cloud at Lenovo 330
  - Case #3, Video Case: Supply Chain Performance Management 331
  - Data Analysis & Decision Making: Assessing the Cost/Benefits of Cloud CRM 331

### 11 Performance Management using Data Visualization, Mashups, and Mobile Intelligence 333

- Case #1, Opening Case: Data Viz iPad App Improves America First's Performance 334
- 11.1 Data Visualization and Data Discovery 338
- 11.2 Enterprise Data Mashups 343
- 11.3 Business Dashboards 347
- 11.4 Mobile Dashboards and Intelligence 349
  - Case #2, Visualization Case: Are You Ready for Some Football? 353
  - Case #3, Video Case: Mashup-Driven Dashboards and Reporting 353
  - Data Analysis & Decision Making: Know Your Facebook Fans with Mobile Intelligence 353

## Part IV IT Planning, Strategy, and Ethics

### 12 IT Strategy, Sourcing, and Vendor Relationships 355

- Case #1, Opening Case: Consumer Banks Reinvent with New Business and IT Strategies 356
- 12.1 IT Strategy and the Strategic Planning Process 358
- 12.2 IT Governance 367
- 12.3 Aligning IT with Business Strategy 369
- 12.4 IT Operating Plans and Sourcing Strategies 373
- 12.5 IT Vendor Relationships 380
  - Case #2, Business Case: PUMA Sources Its Billing Department 383
  - Case #3, Webinar Case: Strategic Value of Health Info Exchange at UMass Memorial 385
  - Data Analysis & Decision Making: Third-Party vs. Company-Owned Offshoring 385

**13 Business Process and Project Management 387**

*Case #1, Opening Case: AutoTrader.com's Order Process Goes from Fragile to Flexible* 388

**13.1** Business Process Management (BPM) 390

**13.2** Software Architecture and IS Design 399

**13.3** IT Project Management 405

**13.4** Systems Development 408

*Case #2, Business Case: Pep Boys' IT Planning Process* 416

*Case #3, Video Case: BlueWorksLive* 417

*Process Modeling: Modeling a Business Process and Brainstorming a Business Using ARIS Express and Blueprint* 417

**14 IT Ethics and Responsible Conduct 418**

*Case #1, Opening Case: Recognizing Corporate Social Media Discrimination* 419

**14.1** Can IT Cut its Global Carbon Footprint? Can Users? 422

**14.2** Responsible Conduct 428

**14.3** Connectivity Overload and a Culture of Distraction 431

**14.4** On the Verge of a New Tech Revolution 433

*Case #2, Business Case: Target's Big Data Analytics Know Too Much* 437

*Case #3, Video Case: Backlash against Google Street View* 437

*Simulation: Global Warming Calculator* 437

**Glossary** G-1

**Organizational Index** O-1

**Name Index** N-1

**Subject Index** S-1

This page is intentionally left blank

# PREFACE

Mega-forces in Information Technology (IT) are creating an exciting new world. Leading technology trends—namely *social, mobile, cloud, big data, and analytics*—offer unprecedented business opportunities. When these technologies converge, organizations are able to gain a competitive edge, to expand market reach, to build brands, and to develop innovative features or ways of doing business. Today’s managers, leaders, entrepreneurs and knowledge workers need to know how to leverage the power of innovative technologies, media, networks, platforms, services, and devices. They now need talents and skills that were not part of our vocabulary five years ago—or maybe five months ago.

In this 9th edition, students learn, explore and analyze the latest information technologies and their impact on, well, *almost everything*. Students learn how strategy, operations, supply chains, customer and supplier relationships, collaboration, reporting, recruiting, financing, performance, growth, productivity, and their career success are driven by and dependent on IT-capabilities. Here are a few examples of influential IT developments as well as disruptive impacts of IT covered in this book:

- **Big data, or databases so large they can’t be handled with traditional software**, is the next frontier for innovation, competition, and productivity. Big data is produced by companies that track all of our Internet activity, online purchases, and social media interactions. Big data analytics turns ambiguity into clarity and action.
- Financing is a core component of any business. **Crowdfunding, raising small amounts of money from many people**, grew from a \$32 million market in May 2010 to a \$123 million market by May 2012. **Kickstarter** transformed the investment process for investors and entrepreneurs by providing a funding alternative to turn good business ideas into reality.
- From customer service and qualitative research to promotional support and reinforcing a brand, **Facebook** is a tremendous marketing tool. The value of **social media** lies in the fact that it is the most pervasive form of 2 way communication ever created. Social media helps grow business and create meaningful customer relationships.
- **Twitter** enables direct contact with customers. Brands can chat with existing customers and jump into conversations to grow their fan base.

- **Mobility and cloud computing** are changing how people and companies interact with information. Mobile technology has a huge impact on customer behavior and expectations.
- **Sustainability** and green business are smart business.
- With **data visualization, dashboards, and enterprise mashups**, users can better prepare for and respond to unanticipated events and make more effective decisions in complex, dynamic situations.

## Engaging Students to Assure Learning

**Information Technology for Management** 9th edition engages students with up-to-date coverage of the most important IT trends today. Over the years, this leading IT textbook had distinguished itself with an emphasis on illustrating the use of cutting edge business technologies for achieving managerial goals and objectives. The 9th edition continues this tradition with more hands-on activities and analyses.

Each chapter contains numerous case studies and real world examples illustrating how businesses increase productivity, improve efficiency, enhance communication and collaboration, and gain a competitive edge through the use of ITs. Faculty will appreciate a variety of options for reinforcing student learning, that include:

### 3 Cases

- **Case #1**, Opening case
- **Case #2**, Business case
- **Case #3**, Video case

### Within chapter learning aids

- Vocabulary in the margins
- Videos references
- Tech notes

### End-of-Chapter learning aids

- “Evaluate and Expand Your Learning” sections
  1. IT and Data Management Decisions
  2. Questions for Discussion & Review
  3. Online Activities
  4. Collaborative Work
- Data Analysis & Decision Making sections

**Other pedagogical features**

- **Quick Look.** The chapter outline provides a quick indication of the major topics covered in the chapter.
- **Learning Outcomes.** Learning outcomes listed at the beginning of each chapter help students focus their efforts and alert them to the important concepts that will be discussed.
- **IT at Work.** The *IT at Work* boxes spotlight real-world cases and innovative uses of IT.

## New and Enhanced Features of 9th Edition

The textbook consists of 14 chapters organized into four parts. Chapters 1 and 11 are new. All other chapters have new sections as well as updated sections, as shown in Table P-1.

**TABLE P-1** Overview of New and Expanded IT Issues; and Several of the Innovative Organizations that are Discussed in the Chapters

Chapter	New & Expanded Issues	Innovative Organizations
1: A Look Toward the Future of Information Technology	Crowdfunding Cloud computing The Internet of Things IT consumerization	Kickstarter.com
2: Information Management and IT Architecture	Enterprise mashups Information management Cloud services Virtualization Virtual machines (VM)	PaulMcCartney.com
3: Database, Data Warehouse, and Data Mining	Big data Operational intelligence Data ownership Compliance	msnNow
4: Networks, Collaboration, and Sustainability	Mobile infrastructure Sustainability Machine-to-machine communication Near-field communication SharePoint	Evernote iMindmap Online
5: CyberSecurity, Compliance, and Business Continuity	BYOD Hacktivism IT consumerization Advanced persistent threats <i>Do not carry</i> policies IT governance	Anonymous & LulzSec AT&T Toggle
6: E-Business & E-Commerce Models and Strategies	International e-business Internet Advertising Search engine marketing (SEM)	Google, Inc. Realtor.com
7: Mobile Technologies and Commerce	Consumer use of mobile tech Innovation in traditional and web-based retail Location-based marketing In-store mobile payments	Chegg.com Shopkick
8: Web 2.0 and Social Media	Social media platforms & services Feature convergence Application Programmint Interfaces (APIs) Social semantic web services	Bottlenose Poolparty.biz Google+
9: Functional Area and Compliance Systems	Customer touchpoints Tag management Interactive data	SquareUp AdWeek
10: Enterprise Systems and Applications	On-demand CRM Enterprise application integration	Joint Munitions Command Kissmetrics.com

(continued)

**TABLE P-1** Overview of New and Expanded IT Issues; and Several of the Innovative Organizations that are Discussed in the Chapters (*continued*)

Chapter	New & Expanded issues	Innovative Organizations
11: Performance Management using Data Visualization, Mashups, and Mobile Intelligence	Data visualization Mobile dashboards User experience D3—data driven documents	Roambi.com Tableau software AlphaVision WeDo Technologies SoftwareFX
12: IT Strategy, Sourcing, and Vendor Relationships	Transparency High-end analytics SOA Business processing outsourcing IT vendor relationships	Mint.com Prosper.com Firescope.com
13: Business Process and Project Management	BPM mashups Who's accountable for IT failures	BlueWorksLive.com AutoTrader.com ARIS Express BPM.com
14: IT Ethics and Responsible Conduct	Social discrimination Responsible conduct	JobVite.com Social Intelligence

- **Solid theoretical foundations.** Throughout the book, students learn the theoretical foundation necessary for understanding IT.
  - **Up-to-date.** Every topic in the book has been researched to find the most up-to-date information and features.
  - **Economic justification.** With the sluggish economic recovery, IT costs and proofs of concept are being demanded prior to investments. Students learn about various cost factors, including total cost of ownership and service level agreements.
  - **IT Ethics, sustainability, and responsible conduct.** IT has become so pervasive, invasive, prevalent, and a power-guzzler that ethics, sustainability and responsible conduct need to be addressed. For example, we clearly explain how contributions from the field of IT can lead to reduced carbon emissions and global warming, improving quality of life on the planet now and for future generations. We also help students to understand the critical issues related to cyber security, privacy invasion and other data-related abuses so that students can and assess characteristics of responsible conduct.
- Supplementary Materials**
- An extensive package of instructional materials is available to support this 9th edition.
- **Instructor's Manual.** The Instructor's Manual presents objectives from the text with additional information to make them more appropriate and useful for the instructor. The manual also includes practical applications of concepts, case study elaboration, answers to end-of-chapter questions, questions for review, questions for discussion, and Internet exercises.
  - **Test Bank.** The test bank contains over 1,000 questions and problems (about 75 per chapter) consisting of multiple-choice, short answer, fill-ins, and critical thinking/essay questions.
  - **Computerized Test Bank.** This electronic version of the test bank allows instructors to customize tests and quizzes for their students.
  - **PowerPoint Presentation.** A series of slides designed around the content of the text incorporates key points from the text and illustrations where appropriate.
  - **Video Series.** A collection of video clips provides students and instructors with dynamic international business examples directly related to the concepts introduced in the text. The video clips illustrate the ways in which computer information systems are utilized in various companies and industries.
  - **Textbook Web Site.** ([wiley.com/college/turban](http://wiley.com/college/turban)). The book's Web site greatly extends the content and themes of the text to provide extensive support for instructors and students. Organized by chapter, it includes Chapter Resources: tables, figures, link libraries, exercises, and downloadable media-enhanced PowerPoint slides.

## Acknowledgments

Many individuals participated in focus groups or reviews. Our sincere thanks to the following reviewers who



provided valuable feedback, insights, and suggestions that improved the quality of this text.

Joni Adkins, Northwest Missouri State University  
Karlyn Barilovits, Walden University  
Nathan Boyer, Grantham University  
Dr. Lewis Chasalow, The University of Findlay  
Kuan Chen, Purdue University Calumet  
Henry D. Crockett, Tarleton State University  
Amir Dabirian, CSU, Fullerton  
Norzaidi Mohd Daud, Universiti Teknologi MARA  
Michael Donahue, Towson University  
Richard Egan, NJIT  
Samuel Elko, Seton hill university  
Jerry Fjermestad, NJIT  
Robert Gordon, Molloy College  
Raj Heda, Boston University  
Robert Hofkin, Walden University  
Lionel M. Holguin Jr., Athens State University  
Laurence Laning, Xavier University  
Hiram Marrero, Universidad Del Turabo  
Stew Mohr, Rutgers University  
Barin Nag, Towson University

Mike O'Dowd, Colorado Technical University  
Dee Piziak, Concordia University Wisconsin  
Mahesh Raisinghani, TWU School of Management  
Lisa Rich, Athens State University  
Tricia Ryan, Laureate Education/ Walden University  
Nancine Vitale, Dowling College  
Minhua Wang, SUNY Canton  
Charles Wankel, St. John's University  
Gene Wright, UW Milwaukee

We are very thankful for help of Graidi Ainsworth, our assistant, who carried out countless research, editorial and record keeping tasks.

We are grateful for the expert and encouraging leadership of Christopher Ruel, Beth Golub, and Katherine Willis. Our sincere thanks for their guidance, patience and support during the development of this most recent version of the book.

*Efraim Turban*  
*Linda Volonino*  
*Gregory R. Wood*  
*Janice C. Sipior*

## Chapter

## 1

A Look Toward the  
Future of Information  
Technology

## Quick Look

**Case 1, Opening Case:** *Need Start-up Cash?*  
*Try Crowdfunding at Kickstarter.com*

**1.1** IT and Management Opportunities and  
Challenges

**1.2** Top Management Concerns and the Most  
Influential ITs

**1.3** IT Agility, Consumerization, and Competitive  
Advantage

**1.4** Strategic Planning and Competitive Models

**1.5** Why IT Is Important to Your Career, and  
IT Careers

## Key Terms

## Chapter 1 Link Library

## Evaluate and Expand Your Learning

- IT and Data Management Decisions
- Questions for Discussion & Review
- Online Activities
- Collaborative Work

**Case 2, Business Case:** *Building a Sustainable Big City  
with a Competitive Edge*

**Case 3, Video Case, Public Sector:**

*ACCESS NYC—IT Strategy and Transformation*

**Data Analysis & Decision Making:** *Online Interactive  
Demo: Estimating Cost-Savings from Switching to  
the Cloud*

## References

## Learning Outcomes

- 1 Describe IT and management issues, opportunities, and challenges.
- 2 Identify management's top concerns and the most influential ITs.
- 3 Assess the role of IT agility, IT consumerization, and changes in competitive advantage in the second part of the Information Age.
- 4 Explain the strategic planning process, SWOT analysis, and competitive models.
- 5 Realize how IT impacts your career and the positive outlook for IS management careers.

# QUICK LOOK at Chapter 1, A Look Toward the Future of Information Technology

In this opening chapter, you read about management's top concerns and the information systems (ISs) they consider most influential to their organizations. Understanding senior management's priorities is a smart starting point for your career. You learn about the latest information technology (IT) trends that are important across all industry sectors—small and medium businesses (SMB), multinationals, government agencies, healthcare, and nonprofits. Faced with business challenges, as a manager you need to implement IT solutions and track how well they improve performance. Faced with the latest new technology, as a manager you need to be able to determine whether to invest in it and how to acquire or implement it.

The power of IT to turn challenges into opportunities, to create new markets and industries, to disrupt the way work is done, and to make commerce more social and mobile stems from the creativity and talent of managers—not the capabilities of technology. Managers and workers now need talents and skills that weren't part of our vocabulary five to ten years ago—or maybe five to ten months ago.

The opening case describes how *Kickstarter* responded to a universal business challenge facing entrepreneurs and artists—getting enough start-up cash—with crowdfunding.

## CASE 1 OPENING CASE

### Need Start-Up Cash? Try Crowdfunding at Kickstarter.com

**Crowdfunding** is a way to raise money (capital) for new projects by asking for contributions from a large number (crowd) of people via the Web. It's peer-to-peer funding. Also known as **crowdsourcing funding** or **crowdfinancing**.

**Kickstarter** is the world's largest crowdfunding platform for creative projects.

**Project creator** is the creative person who posts his or her project with a video, a description of the concept, and target dollar amount on *Kickstarter.com*.

**Backer** pledges money to a project, in effect making a financial vote of confidence in the project and creator.

**Funding goal** is the amount of money requested by the project creator. If this goal is not reached, the deal is off.

If you have a brilliant idea for a film, music album, street art, or cool tech gadget, where would you get start-up money to make it happen? *Hint:* It's unlikely that you'd get a bank loan and certainly not easily. Huge numbers of cash-challenged entrepreneurs and artists could not achieve their visions because of the lack of financing options available to them.

That is, until **crowdfunding**. In simplest terms, people who need money ask for donations to reach their financial goal and explain what they will produce if they reach that goal; and citizens of the Internet—the "crowd"—decide whether to donate and how much.

**Kickstarter** is the world's largest crowdfunding site for creative projects. Kickstarter is to crowdfunding as eBay is to auctions. They're IT platforms with payment systems that became fun and popular social commerce sites.

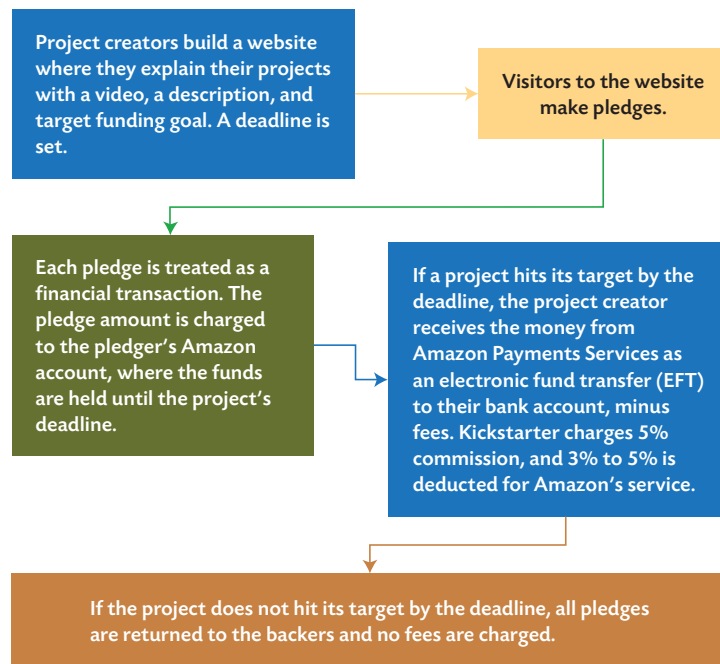
### Crowdfunding Opportunities for Cash-Challenged Artists and Entrepreneurs

Crowdfunding bypasses banks, family, and friends as funding sources. Crowdfunding needs an IT platform that makes it easy and secure to request, donate, and collect online contributions.



© D. Hurst/Alamy Limited

**Figure 1.1** *Kickstarter.com* gives entrepreneurs and those in creative industries online access to money to fund their artistic or business ideas.



**Figure 1.2** The crowdfunding process.

Anyone with a creative project—called project creator—can post an online pitch to potential backers across the world on *Kickstarter.com*. Every week, tens of thousands of people (the crowd) pledge typically from \$1 to \$1,000—totaling millions of dollars—to film, music, art, technology, design, food, publishing, and other creative projects. The crowd decides which projects are worth their investments by pledging funds. Project creators keep 100% ownership and control over their work. Figure 1.2 shows how crowdfunding at Kickstarter works.

### Social Commerce and Incentives

Kickstarter provides the IT platform and payment systems that enable people-to-people commerce, or **social commerce**. Clever incentives and exclusive memberships are offered to backers, which provide the forum for social commerce. Here are three examples:

1. Two California design students in their early twenties, Jesse Genet and Stephan Angoulvant, set a \$12,000 goal to launch Lumi Co., a new textile printing technology. They raised \$13,597 from 188 backers. To entice backers to pledge \$500 or more, they offered a personalized leather envelope, invitations to their launch party and an exclusive event at their Los Angeles offices for the fashion line release, and exclusive newsletters and discounts.
2. TikTok+LunaTik kits turn an iPod nano into a multitouch watch. Project creators asked for \$15,000; but raised nearly \$1 million from 13,512 backers. Backers who pledged \$500 were offered a LunaTik Kickstarter Backer Edition including an 8GB iPod Nano that was laser-signed by designer Scott Wilson. It's now a real product and for sale in the Apple store.
3. Designers of PID-Controlled Espresso Machine, which brings the consistency of expensive espresso machines to a low-cost machine, set a \$20,000 goal. They raised \$369,569 by its January 20, 2012, deadline. The \$1,000 backers were offered a free custom-built machine. Every Kickstarter backer was able to buy the \$400 machine for only \$200.

In 2012, Kickstarter reported that \$100 million was pledged into projects in 2011 with \$84 million going into projects that were actually funded. Movies and music projects were the largest funded areas. Over \$32 million was pledged for films and video—leading to 3,284 successful projects. For music, backers pledged close to \$20 million for 3,653 successful projects. These 2011 stats roughly tripled the 2010 stats.

## Crowdfunding—a Creative Integrated IT Solution

Crowdfunding—which is an integration of social networking, e-commerce, and financing and payment systems—clearly is responsive to the needs of the market. In tough economic times, Kickstarter and other crowdfunding platforms offer the ability to support economic growth by funding project creators worldwide.

Sources: Compiled from *Kickstarter.com* (2012), Pogue (2012), *lumi.co* (2012), and *lunatik.com/* (2012).

### Discuss

1. Visit *Kickstarter.com* and review the “Project of the Day.” What is the project? Review the offerings and number of backers in each level. Which two pledge levels (\$1 through \$1,000) have the highest number of backers? Which pledge levels are sold out, if any? Do the answers to these questions suggest that backers are actually *customers* making purchases (pre-sales) rather than *donors* making selfless contributions?
2. Explain crowdfunding and its advantages to new entrepreneurs.
3. Compare Kickstarter and eBay.
4. What characteristics make Kickstarter a social commerce site?

### Decide

5. Research how Kickstarter and two other crowdfunding sites manage or provide for the collection and transfer of pledges. Based on what you learn, is there a site that you would recommend. Explain why or why not.

### Debate

6. Crowdfunding could be viewed as a technology that disrupts the financing industry. Or it could be viewed as so unique that it has created a new industry. Create two teams, and have each team select one of these views. Debate which of view better reflects the impact of crowdfunding.

## 1.1 IT and Management Opportunities and Challenges

The first section provides background on IT (information technology) and management trends, issues, challenges, and/or opportunities discussed in this chapter.

LIKE, FOLLOW, FAN,  
SNAP, SHARE, JOIN,  
SIGN UP, WATCH

Consider how often and in how many ways companies or brands ask you to connect with them, as shown in Figure 1.3. Why do businesses ask you to like, follow, fan, snap, share, sign up, watch, join, or download?



**Figure 1.3** Common requests from companies and brands to connect with consumers and prospects via social media or mobile devices.

**Figure 1.4** *Overstock.com* uses data analytics to discover what their customers want, whether they like a product, and how they can sell it better.



The short answer is to get access to consumers and data about them to improve performance. Three examples are:

- 1. Overstock.com.** Jonathan Johnson, a retail executive at *Overstock.com*, explained: “We’re not trying to use social media as a sales piece as much as an information-gathering piece. Finding out what our customers want; whether they like a product; how could we sell it better” (Jopson et al., 2011). See Figure 1.4.
- 2. Best Buy.** Electronics retailer Best Buy learned how unpopular its restocking fees were through social media. The company changed its product-return policies eliminating those fees that were hurting sales.
- 3. Starbucks.** Coffee retailer Starbucks prepared to monitor customers’ tweets about a new coffee flavor on the day it was introduced. Managers were surprised to learn that a huge majority of tweets were not about the coffee’s intense taste, but were complaints about the higher price. By the next day, they had dropped the price.

Like many companies, Overstock, Best Buy, and Starbucks are making every effort *to learn* how to improve performance. Several examples of learning efforts to improve performance are listed in Table 1.1.

**NEXT BIG TECH TRENDS  
FOCUSED ON  
COMPETITION, GROWTH,  
AND INNOVATION**

Four current technology trends that offer valuable business opportunities are *social*, *mobile*, *cloud*, and *data analytics*. These ITs are often used in combination to gain a competitive edge, to expand market reach, and to develop new features or ways of doing business. They make it easier and cheaper to connect with customers and suppliers, to work with others from anywhere, and to manage files and data.

**Tech Note 1-1**

The state of Wyoming switched to cloud computing in 2011. This was done by putting 10,000 employees on **Google Apps for Government**.

The financial impact of *mobility* because employees could work from anywhere and better *collaboration* among employees led to a savings of over \$1 million per year.

A short video about *Wyoming’s Story* is posted on the *Google Apps for Government* site [google.com/apps/intl/en/government/](http://google.com/apps/intl/en/government/).

**TABLE 1.1** Common Learning Efforts to Improve Performance

- Which marketing campaigns are the most and least effective and why
- What products to develop
- What customers value and dislike
- How to appeal to key customer groups
- How to select and implement enterprise apps that will make a competitive difference
- What perks strengthen customer loyalty most cost-effectively



### DATA ANALYTICS— FIGURING OUT WHAT THE DATA MEANS

Simply collecting data has no effect on performance. Data needs to be analyzed. **Data analytics** refers to the specialized software, capabilities, and components all geared toward exploring huge volumes of data to provide greater insight and intelligence—and doing so quickly. Why is it important to analyze quickly? One reason is to be able to know how a particular sale or marketing campaign has influenced sales.

The processes needed to prepare for and conduct data analytics are complex and expensive—and require expertise in statistics and modeling. Data analytic processes include:

1. Locating and collecting reliable data from multiple sources that are in various formats.
2. Preparing the data for analysis. Collected data is not usable until it has been organized, standardized, duplicates are removed (called *deduping*), and other data-cleansing processes are done.
3. Performing the correct analyses, verifying the analyses, and then reporting the findings in meaningful ways.

In the early 2000s, the ability to perform data analytics in real time, or near-real time, improved when vendors and consulting companies started offering it as a service. In the 2010s, vendors offered pre-built, hosted analytics and advanced analytics solutions that reduced total cost of ownership (TCO) and made it feasible for companies to implement data analytics.

Macys' and other large retailers used to spend weeks reviewing their last season's sales data. With data analytic capabilities, they can now see instantly how an e-mailed discount code or flash sale for athletic wear played out in different regions. Charles W. Berger, CEO of ParAccel (*ParAccel.com*), a data analytics provider said: "We have a banking client that used to need four days to make a decision on whether or not to trade a mortgage-backed security. They do that in seven minutes now." Data analytics is used by Wal-Mart stores to adjust its inventory levels and prices; and by FedEx for tweaking its delivery routes. *IT at Work 1.1* identifies other users of data analytics.

## IT at Work 1.1

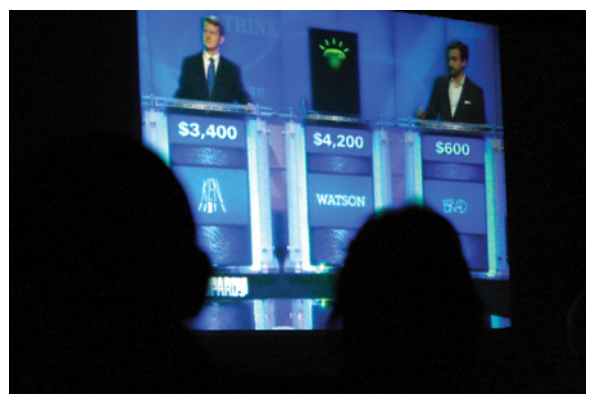
### Watson Wins Jeopardy, Leaving Human Champions in its Silicon Dust

Data analytics have interesting applications. Here is one famous example of data analytics in action.

Watson is a computer system created by a team of 25 IBM scientists over four years. In 2011, Watson competed against Ken Jennings for Brad Rutter on the game show Jeopardy (see Figure 1.5) in a three-day tournament and won. Watson received the clues as electronic texts at the same time they were made visible to Ken and Brad. Watson would then parse the clues into different keywords and sentence fragments in order to find statistically related phrases. Watson won by using its ability to quickly execute thousands of language analysis algorithms simultaneously to compile potential answers and determine its level of confidence in any given answer.

#### Questions

1. Explain how Watson figured out the most likely response to win the tournament.
2. View the IBM demo, "Turning insight into outcomes," at [ibm.com/smarterplanet/us/en/business\\_analytics/article/outperform\\_with\\_smarter\\_analytics.html](http://ibm.com/smarterplanet/us/en/business_analytics/article/outperform_with_smarter_analytics.html).
3. Discuss how companies in various industries are using the insights from analytics to achieve significant outcomes in customer satisfaction and retention, operational efficiency, financial processes, and/or risk, fraud, and compliance management.



© ZUMA Wire Service/Alamy Limited

**Figure 1.5** Using data analytics, Watson beats Ken and Brad playing Jeopardy.



Data analytics can help companies achieve these business outcomes:

- Grow their customer base
- Retain the most profitable customers.
- Continuously improve operational efficiency.
- Transform and automate financial processes.
- Detect and deter fraud.

One example is Florida Power and Light (FPL). Mark Schweiger, a senior business analyst at FPL, helped implement a data analytics program to detect electricity theft. Theft was being detected using visual inspection by meter readers and field investigators. FPL knew that an advanced metering infrastructure system would provide data that could flag suspicious accounts for closer examination. In 2009, FPL began implementing a meter data analytics program with the help of vendor DataRaker (*dataraker.com*) estimated for use by 2013.

FPL feeds its vendor meter and customer data, which the vendor crunches to create meaningful red flags indicating electricity theft. The program helps detect when someone is using an unauthorized meter, is bypassing an approved meter, is using a powerful magnet to suppress usage (and billing) data, and has reconnected service without authorization.

### MESSY DATA

As you know from your own experience, a lot of data is now text—and text is messy. **Messy data** is the term used to refer to data (e.g., tweets, posts, click streams, images, including medical images) that cannot be organized in a way that a computer can easily process. Data sources include smartphones, social networks, microblogs, click streams from online activities, location-aware mobile devices, scanners, and sensors that automatically collect everything from inventory movement to heart rates. Michael Olson, CEO of Cloudera (*cloudera.com*) explained:

*The old days were about asking, “What is the biggest, smallest, and average?” Today it’s, “What do you like? Who do you know? “It’s answering these complex questions.*

In 2012, research firm Gartner predicted that data will grow 800 percent over the next five years, and 80 percent of the data will be unstructured.

### BIG DATA ANALYTICS— THE NEXT FRONTIER OF OPPORTUNITIES

Huge sets of messy data from sources such as multi-petabyte data warehouses, social media, and mobile devices are called **big data**. Research by the McKinsey Global Institute found that **big data analytics**, which is the ability to analyze big data sets, is the next frontier of opportunities for competition, productivity growth, and innovation (Manyika, 2011). Most other research and consulting firms agree that data analytics to gain insights and a competitive edge is one of the biggest opportunities and challenges facing managers.

#### Questions

1. Why do businesses ask you to like, follow, fan, or interact with them via social networks or web sites?
2. Why is data analytics challenging for companies?
3. Explain messy data.
4. What are the sources of messy data?
5. Explain big data analytics.

## 1.2 Top Management Concerns and Influential ITs

What do managers consider the most critical building blocks to improving their ability to do their jobs and organizational performance? What ITs are most influential? You will read answers to these questions in this section.

**TABLE 1.2** Summary of Characteristics of High-Quality Information

Quality Characteristic	Description
Relevant	Information is either relevant or irrelevant to a decision. Irrelevant information interferes with the process—no matter how interesting it is—because it wastes time or causes confusion or delay. Irrelevant information is a persistent problem because ISSs are good at generating lots of it.
Timely	This characteristic means that the decision maker receives the information when he or she needs it—that is, when it would be meaningful to the decision. For example, the manager of a retail chain needs daily information on stores' performance and products that are selling unusually high or low, so that immediate corrective action can be taken. Receiving performance information at the end of the month leaves thirty-day gaps in corrective actions.
Reliable, accurate	This characteristic means that the information can be trusted and that the decision maker has confidence that information is free from errors, to the extent possible. For example, calculations are correct and data are in correct categories. When information is trusted, it eliminates wasting time having to verify it. Typically, it is more important for the information to be timely than to be perfect.
Easy to understand and use	This characteristic means that information is presented clearly, and concisely, and is well-documented.

### BUSINESS PERFORMANCE DEPENDS ON QUALITY INFORMATION AND IT CAPABILITIES

Business performance is directly related to the quality of information. Table 1.2 describes the key characteristics of high-quality information.

An important principle is that what a company can accomplish or achieve depends on what its ITs can do. And for many, business survival depends on IT innovation. Oana Garcia, vice president and Chief Data Officer at Citigroup New York, pointed out that “business and technology teams need to work together and understand the benefits of smart, cost-effective, and collaborative data management, and the implementation of this knowledge is key (*McKinsey Quarterly*, 2011).

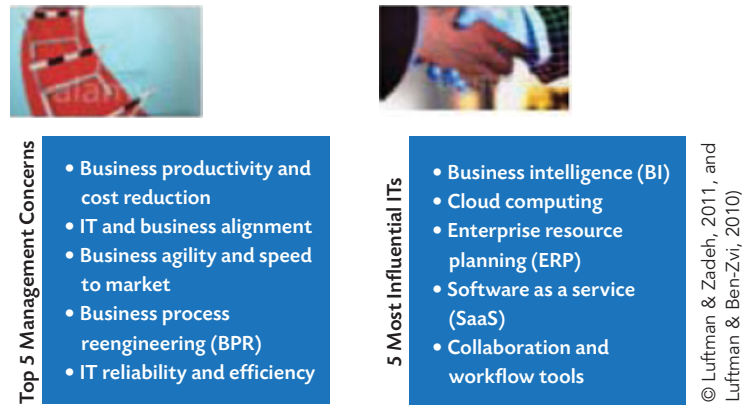
Managers of a large U.S. retailer experienced this principle in 2011 as they struggled to understand why their sales were dropping. They had been implementing new online promotions, yet continued losing market share in several profitable segments to a major competitor. When senior managers researched their competitor's practices, they discovered that their problem ran deeper than they had imagined. The competitor had invested heavily in ITs to develop capabilities to collect, integrate, and analyze data from each store and every sales unit. Data was used to run real-world experiments prior to making business decisions. In addition, the competitor had linked its databases to suppliers' databases, which made it possible to adjust prices in real time, to reorder hot-selling items automatically, and to shift items from store to store easily. Their rival's agility and flexibility enabled them to gain an edge and market share.

Despite potential benefits, managers must be careful to avoid “paralysis of analysis.” They should not lose agility and flexibility in the hope of gathering perfect data when making time-sensitive decisions.

### PRIORITIES DRIVE INVESTMENTS

Another well-known principle states *what's important gets done*. With economic and business conditions recovering slowly, but not steadily, from the worldwide 2008–2011 recessions, budgets and resources are tight. Investment options are

**Figure 1.6** Top 5 management concerns and 5 most influential ITs. These findings are based on survey responses from 472 organizations—172 U.S., 142 European, 103 Asian, and 55 Latin America—in mid-2010.



scrutinized to determine their value potential. With limited resources available, priorities (those with the highest payoff potential) get funded, while non-priorities get cut when budget decisions are made.

A helpful way to understand business priorities, issues, challenges, and trends is to look at what managers in the United States, Europe, Asia, and Latin America have reported as their top concerns and the ITs that are most influential to success. Refer to Figure 1.6. The two top 5 lists summarize the Society for Information Management (SIM) survey responses from 472 organizations—172 U.S., 142 European, 103 Asian, and 55 Latin American—in mid-2010. In previous economic downturns, business executives typically had cut back on IT budgets (as well as advertising and new product development) to reduce costs. But in the latest recession, which was worse than prior ones, the opposite has occurred. Taking both top 5 lists into consideration indicates that executives are relying on IT to help cut costs and boost productivity. You read about the ITs listed in Figure 1.6 in the next sections and chapters.

### TOP 5 MANAGEMENT CONCERNS

**Business productivity and cost reduction.** Business productivity and cost reduction were the top concerns by a wide margin. **Productivity** is a measure of efficiency and can be represented by the following model (formula).

$$productivity = \frac{outputs}{inputs}$$

Types of outputs depend on the industry. Outputs can be the number of units manufactured or sold, the number of customers serviced, or the value of new deposits. Inputs are the resources used to produce the outputs. Examples are the number of labor hours, amount of raw materials, and technology. Productivity gains can be achieved by:

- Increasing output, while maintaining the same level of inputs
- Maintaining output, while reducing the level of inputs
- A combination of the above

**IT and Business Alignment.** Aligning IT with business means leveraging opportunities for IT to support business strategy and improve success. IT-business alignment depends on the IT department understanding strategy, risks, opportunities; and the business understanding IT's potential and limitations.

**Business Agility and Speed to Market.** Boom economic conditions typically provide companies with plenty of opportunities to improve performance. But during downturns and global financial crises, opportunities are harder to find, and the risk of failure rises. As markets recover from a worldwide recession, managers are exploring new strategies to improve business performance, or profitability. One approach