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**Fifteenth
Edition**

Management Information Systems

**Managing the
Digital Firm**



**Kenneth C. Laudon
Jane P. Laudon**

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FIFTEENTH EDITION

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Indian Subcontinent Adaptation

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The Laudons have two daughters, Erica and Elisabeth, to whom this book is dedicated.

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Chapter 15: Managing Global Systems

The Bel Group: Laughing All the Way to Success
Indian E-commerce: Obstacles to Opportunity
One Organization, One Data, One Information: ONGC's Global System
Crocs Clambers to Global Efficiency

Preface

The Global Edition is written for business school students in Europe, the Middle East, South Africa, Australia, and the Pacific Asian region. Case studies and examples focus on how firms in these regions use information systems. We wrote this book for business school students who wanted an in-depth look at how today's business firms use information technologies and systems to achieve corporate objectives. Information systems are one of the major tools available to business managers for achieving operational excellence, developing new products and services, improving decision making, and achieving competitive advantage. Students will find here the most up-to-date and comprehensive overview of information systems used by business firms today. After reading this book, we expect students will be able to participate in, and even lead, management discussions of information systems for their firms.

When interviewing potential employees, business firms often look for new hires who know how to use information systems and technologies for achieving bottom-line business results. Regardless of whether you are an accounting, finance, management, operations management, marketing, or information systems major, the knowledge and information you find in this book will be valuable throughout your business career.

What's New in This Edition

Currency

The 15th edition features all new opening, closing, and Interactive Session cases. The text, figures, tables, and cases have been updated through September 2016 with the latest sources from industry and MIS research.

New Topics

- **Big Data and the Internet of Things:** In-depth coverage of big data, big data analytics, and the Internet of Things (IoT) in Chapters 1, 6, 7, and 12. Includes big data analytics, analyzing IoT data streams, Hadoop, in-memory computing, non-relational databases, and analytic platforms.
- **Cloud Computing:** Updated and expanded coverage of cloud computing in Chapter 5 (IT infrastructure) with more detail on types of cloud services, private and public clouds, hybrid clouds, managing cloud services, and a new Interactive Session on using cloud services. Cloud computing also covered in Chapter 6 (databases in the cloud), Chapter 8 (cloud security), Chapter 9 (cloud-based CRM and ERP), Chapter 10 (e-commerce), and Chapter 13 (cloud-based systems development).
- **Social, Mobile, Local:** New e-commerce content in Chapter 10 describing how social tools, mobile technology, and location-based services are transforming marketing and advertising.

- **Social Business:** Expanded coverage of social business, introduced in Chapter 2 and discussed in throughout the text. Detailed discussions of enterprise (internal corporate) social networking as well as social networking in e-commerce.
- BYOD and mobile device management
- Smart products
- DevOps
- Zero-day vulnerabilities
- Machine learning
- Chatbots
- Near field communication (NFC)
- Native advertising
- Windows 10
- Microsoft Office 365
- Zero-day vulnerabilities
- Platforms
- Software-defined storage (SDS)

The 15th Edition: The Comprehensive Solution for the MIS Curriculum

Since its inception, this text has helped to define the MIS course around the globe. This edition continues to be authoritative but is also more customizable, flexible, and geared to meeting the needs of different colleges, universities, and individual instructors. Many of its learning tools are now available in digital form. This book is now part of a complete learning package that includes the core text, and Learning Tracks.

The core text consists of 15 chapters with hands-on projects covering the most essential topics in MIS.

The CORE Text

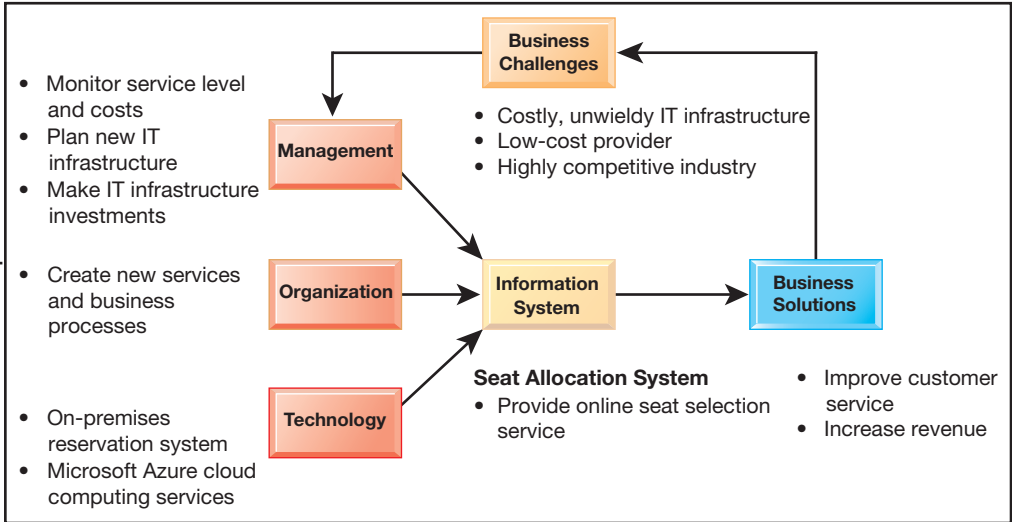
The core text provides an overview of fundamental MIS concepts using an integrated framework for describing and analyzing information systems. This framework shows information systems composed of management, organization, and technology elements and is reinforced in student projects and case studies.

Chapter Organization

Each chapter contains the following elements:

- A Chapter Outline based on Learning Objectives
- Lists of all the Case Studies
- A chapter-opening case describing a real-world organization to establish the theme and importance of the chapter

A diagram accompanying each chapter-opening case graphically illustrates how management, organization, and technology elements work together to create an information system solution to the business challenges discussed in the case.



- A diagram analyzing the opening case in terms of the management, organization, and technology model used throughout the text
- Two Interactive Sessions with Case Study Questions
- A Review Summary keyed to the Student Learning Objectives
- A list of Key Terms that students can use to review concepts
- Review questions for students to test their comprehension of chapter material
- Discussion questions raised by the broader themes of the chapter
- A series of Hands-on MIS Projects consisting of two Management Decision Problems, a hands-on application software project, and a project to develop Internet skills
- A Collaboration and Teamwork Project to develop teamwork and presentation skills with options for using open source collaboration tools
- A chapter-ending case study for students to apply chapter concepts
- Two assisted-graded writing questions with prebuilt grading rubrics
- Chapter references

Key Features

We have enhanced the text to make it more interactive, leading edge, and appealing to both students and instructors. The features and learning tools are described in the following sections.

Business-Driven with Real-World Business Cases and Examples

The text helps students see the direct connection between information systems and business performance. It describes the main business objectives driving the use of information systems and technologies in corporations all over the world: operational excellence, new products and services, customer and supplier intimacy, improved decision making, competitive advantage, and survival.

In-text examples and case studies show students how specific companies use information systems to achieve these objectives.

We use only current (2016) examples from business and public organizations throughout the text to illustrate the important concepts in each chapter. All the case studies describe companies or organizations that are familiar to students, such as Nike, Rugby Football Union, Facebook, Walmart, Fiat, Unilever, and GE.

Interactivity

There's no better way to learn about MIS than by doing MIS! We provide different kinds of hands-on projects where students can work with real-world business scenarios and data and learn firsthand what MIS is all about. These projects heighten student involvement in this exciting subject.

- **Interactive Sessions.** Two short cases in each chapter have been redesigned as Interactive Sessions to be used in the classroom (or on Internet discussion boards) to stimulate student interest and active learning. Each case concludes with case study questions. The case study questions provide topics for class discussion, Internet discussion, or written assignments.

INTERACTIVE SESSION: TECHNOLOGY

Getting Social with Customers

Businesses of all sizes are finding Facebook, Twitter, and other social media to be powerful tools for engaging customers, amplifying product messages, discovering trends and influencers, building brand awareness, and taking action on customer requests and recommendations. Half of all Twitter users recommend products in their tweets.

About 1.6 billion people use Facebook, and more than 30 million businesses have active brand pages, enabling users to interact with the brand through blogs, comment pages, contests, and offerings on the brand page. The "like" button gives users a chance to share with their social network their feelings about content and other objects they are viewing and websites they are visiting. With like buttons on millions of websites, Facebook can track user behavior on other sites and then sell this information to marketers. Facebook also sells display ads to firms that show up in the right column of users' home pages and most other pages in the Facebook interface such as photos and apps.

Twitter has developed many new offerings to interest advertisers, like "promoted tweets" and "promoted trends." These features give advertisers the ability to have their tweets displayed more prominently when Twitter users search for certain keywords. Many big advertisers are using Twitter's Vine service, which allows users to share short, repeating videos with a mobile-phone app or post them on other platforms such as Facebook.

Lowe's is using Facebook mobile video and Snapchat image messaging to help first-time millennial home buyers learn home improvement skills. The home improvement retailer launched a new series of social videos in April 2016 to showcase spring cleaning and do-it-yourself projects. Lowe's believes this is a more immediate and interactive way to reach

Lowe's "In-a-Snap" Snapchat series tries to inspire young homeowners and renters to undertake simple home improvement projects such as installing shelves to build a study nook. During the Lowe's Snapchat story, users can tap on the screen to put a nail in a wall or chisel off an old tile. Lowe's is working on another series of video tutorials on Facebook and Instagram called "Home School" that uses drawings from chalk artists to animate maintenance projects.

Lowe's social media activities have helped increase brand engagement. Although the company's social campaigns are designed to teach first-time homeowners or young renters about home improvement, the company is also hoping they will encourage consumers to think differently about the brand beyond its products and services. Management believes millennials who are becoming first-time homeowners want to know the deeper meaning of what a company is trying to stand for, not just the products and services it offers.

An estimated 90 percent of customers are influenced by online reviews, and nearly half of U.S. social media users actively seek customer service through social media. As a result, marketing is now placing much more emphasis on customer satisfaction and customer service. Social media monitoring helps marketers and business owners understand more about likes, dislikes, and complaints concerning products, additional products or product modifications customers want, and how people are talking about a brand (positive or negative sentiment).

General Motors (GM) has 26 full-time social media customer care advisers for North America alone, covering more than 150 company social channels from GM, Chevrolet, Buick, GMC, and Cadillac, and approximately 95 sites such as automotive enthusiast

Each chapter contains two Interactive Sessions on Management, Organizations, or Technology using real-world companies to illustrate chapter concepts and issues.

- **Hands-On MIS Projects.** Every chapter concludes with a Hands-On MIS Projects section containing three types of projects: two Management Decision Problems; a hands-on application software exercise using Microsoft Excel, Access, or web page and blog creation tools; and a project that develops Internet business skills.
- **Collaboration and Teamwork Projects.** Each chapter features a collaborative project that encourages students working in teams to use Google Drive, Google Docs, or other open source collaboration tools. The first team project in Chapter 1 asks students to build a collaborative Google site.

Case Study Questions encourage students to apply chapter concepts to real-world companies in class discussions, student presentations, or writing assignments.

CASE STUDY QUESTIONS

1. Assess the management, organization, and technology issues for using social media technology to engage with customers.
2. What are the advantages and disadvantages of using social media for advertising, brand building, market research, and customer service?
3. Give an example of a business decision in this case study that was facilitated by using social media to interact with customers.
4. Should all companies use social media technology for customer service and marketing? Why or why not? What kinds of companies are best suited to use these platforms?

Two real-world business scenarios per chapter provide opportunities for students to apply chapter concepts and practice management decision making.

Management Decision Problems

11-8 U.S. Pharma Corporation is headquartered in New Jersey but has research sites in Germany, France, the United Kingdom, Switzerland, and Australia. Research and development of new pharmaceuticals is key to ongoing profits, and U.S. Pharma researches and tests thousands of possible drugs. The company's researchers need to share information with others within and outside the company, including the U.S. Food and Drug Administration, the World Health Organization, and the International Federation of Pharmaceutical Manufacturers & Associations. Also critical is access to health information sites, such as the U.S. National Library of Medicine, and to industry conferences and professional journals. Design a knowledge portal for U.S. Pharma's researchers. Include in your design specifications relevant internal systems and databases, external sources of information, and internal and external communication and collaboration tools. Design a home page for your portal.

11-9 Canadian Tire is one of Canada's largest companies, with 50,000 employees and 1,100 stores and gas bars (gas stations) across Canada selling sports, leisure, home products, apparel, and financial services as well as automotive and petroleum products. The retail outlets are independently owned and operated. Canadian Tire has been using daily mailings and thick product catalogs to inform its dealers about new products, merchandise setups, best practices, product ordering, and problem resolution, and it is looking for a better way to provide employees with human resources and administrative documents. Describe the problems created by this way of doing business and how knowledge management systems might help.

Students practice using software in real-world settings for achieving operational excellence and enhancing decision making.

Item	Store	Sales Regic	Item Descripti	Unit Pri	Units So	Week Ending	Click to Add
1	1	South	2005 17" Monitor	\$229.00	28	10/27/2016	
2	1	South	2005 17" Monitor	\$229.00	30	11/24/2016	
3	1	South	2005 17" Monitor	\$229.00	9	12/29/2016	
4	1	South	3006 101 Keyboard	\$19.95	30	10/27/2016	
5	1	South	3006 101 Keyboard	\$19.95	35	11/24/2016	
6	1	South	3006 101 Keyboard	\$19.95	39	12/29/2016	
7	1	South	6050 PC Mouse	\$8.95	28	10/27/2016	
8	1	South	6050 PC Mouse	\$8.95	3	11/24/2016	
9	1	South	6050 PC Mouse	\$8.95	38	12/29/2016	
10	1	South	8500 Desktop CPU	\$849.95	25	10/27/2016	
11	1	South	8500 Desktop CPU	\$849.95	27	11/24/2016	
12	1	South	8500 Desktop CPU	\$849.95	33	12/29/2016	
13	2	South	2005 17" Monitor	\$229.00	8	10/27/2016	
14	2	South	2005 17" Monitor	\$229.00	8	11/24/2016	
15	2	South	2005 17" Monitor	\$229.00	10	12/29/2016	
16	2	South	3006 101 Keyboard	\$19.95	8	10/27/2016	
17	2	South	3006 101 Keyboard	\$19.95	8	11/24/2016	
18	2	South	3006 101 Keyboard	\$19.95	8	12/29/2016	
19	2	South	6050 PC Mouse	\$8.95	9	10/27/2016	
20	2	South	6050 PC Mouse	\$8.95	9	11/24/2016	
21	2	South	6050 PC Mouse	\$8.95	8	12/29/2016	
22	2	South	8500 Desktop CPU	\$849.95	18	10/27/2016	

Improving Decision Making: Using Web Tools to Configure and Price an Automobile

Software skills: Internet-based software

Business skills: Researching product information and pricing

3-11 In this exercise, you will use software at car websites to find product information about a car of your choice and use that information to make an important purchase decision. You will also evaluate two of these sites as selling tools.

You are interested in purchasing a new Ford Escape (or some other car of your choice). Go to the website of CarsDirect (www.carsdirect.com) and begin your investigation. Locate the Ford Escape. Research the various Escape models, and choose one you prefer in terms of price, features, and safety ratings. Locate and read at least two reviews. Surf the website of the manufacturer, in this case Ford (www.ford.com). Compare the information available on Ford's website with that of CarsDirect for the Ford Escape. Try to locate the lowest price for the car you want in a local dealer's inventory. Suggest improvements for CarsDirect.com and Ford.com.

Each chapter features a project to develop Internet skills for accessing information, conducting research, and performing online calculations and analysis.

Assessment and AACSB Assessment Guidelines

The Association to Advance Collegiate Schools of Business (AACSB) is a not-for-profit corporation of educational institutions, corporations, and other organizations that seeks to improve business education primarily by accrediting university business programs. As a part of its accreditation activities, the AACSB has developed an Assurance of Learning Program designed to ensure that schools do in fact teach students what they promise. Schools are required to state a clear mission, develop a coherent business program, identify student learning objectives, and then prove that students do in fact achieve the objectives.

We have attempted in this book to support AACSB efforts to encourage assessment-based education. The back end papers of this edition identify student learning objectives and anticipated outcomes for our Hands-On MIS projects. The authors will provide custom advice on how to use this text in colleges with different missions and assessment needs. Please e-mail the authors or contact your local Pearson representative for contact information.

For more information on the AACSB Assurance of Learning Program and how this text supports assessment-based learning, please visit the website for this book.

Customization and Flexibility: Learning Track Modules

Our Learning Tracks feature gives instructors the flexibility to provide in-depth coverage of the topics they choose. This supplementary content takes students deeper into MIS topics, concepts, and debates; reviews basic technology concepts in hardware, software, database design, telecommunications, and other areas.

Author-Certified Test Bank and Supplements

- **Author-Certified Test Bank.** The authors have worked closely with skilled test item writers to ensure that higher-level cognitive skills are tested. Test bank multiple-choice questions include questions on content but also include many questions that require analysis, synthesis, and evaluation skills.
- **Annotated Slides.** The authors have prepared a comprehensive collection of 50 PowerPoint slides for each chapter to be used in your lectures. Many of these slides are the same as used by Ken Laudon in his MIS classes and executive education presentations. Each of the slides is annotated with

teaching suggestions for asking students questions, developing in-class lists that illustrate key concepts, and recommending other firms as examples in addition to those provided in the text. The annotations are like an Instructor's Manual built into the slides and make it easier to teach the course effectively.

Student Learning-Focused

Student Learning Objectives are organized around a set of study questions to focus student attention. Each chapter concludes with a Review Summary and Review Questions organized around these study questions, and each major chapter section is based on a Learning Objective.

Career Resources

The Instructor Resources for this text include extensive Career Resources, including job-hunting guides and instructions on how to build a Digital Portfolio demonstrating the business knowledge, application software proficiency, and Internet skills acquired from using the text. The portfolio can be included in a resume or job application or used as a learning assessment tool for instructors.

Instructor Resources

At the Instructor Resource Center, <http://www.pearsoned.co.in/KennethCLaudon/>, instructors can easily register to gain access to a variety of instructor resources available with this text in downloadable format. If assistance is needed, our dedicated technical support team is ready to help with the media supplements that accompany this text. Visit <http://support.pearson.com> for answers to frequently asked questions and toll-free user support phone numbers.

The following supplements are available with this text:

- Instructor's Resource Manual
- Test Bank
- TestGen® Computerized Test Bank
- PowerPoint Presentation
- Lecture Notes

Learning Tracks

Chapter	Learning Tracks
Chapter 1: Information Systems in Global Business Today	How Much Does IT Matter? Information Systems and Your Career The Mobile Digital Platform
Chapter 2: Global E-business and Collaboration	Systems From a Functional Perspective IT Enables Collaboration and Teamwork Challenges of Using Business Information Systems Organizing the Information Systems Function Occupational and Career Outlook for Information Systems Majors 2014–2020
Chapter 3: Information Systems, Organizations, and Strategy	The Changing Business Environment for IT

Chapter	Learning Tracks
Chapter 4: Ethical and Social Issues in Information Systems	Developing a Corporate Code of Ethics for IT
Chapter 5: IT Infrastructure and Emerging Technologies	How Computer Hardware Works How Computer Software Works Service Level Agreements The Open Source Software Initiative Comparing Stages in IT Infrastructure Evolution Cloud Computing
Chapter 6: Foundations of Business Intelligence: Databases and Information Management	Database Design, Normalization, and Entity-Relationship Diagramming Introduction to SQL Hierarchical and Network Data Models
Chapter 7: Telecommunications, the Internet, and Wireless Technology	Broadband Network Services and Technologies Cellular System Generations Wireless Applications for Customer Relationship Management, Supply Chain Management, and Healthcare Introduction to Web 2.0 LAN Topologies
Chapter 8: Securing Information Systems	The Booming Job Market in IT Security The Sarbanes-Oxley Act Computer Forensics General and Application Controls for Information Systems Management Challenges of Security and Control Software Vulnerability and Reliability
Chapter 9: Achieving Operational Excellence and Customer Intimacy: Enterprise Applications	SAP Business Process Map Business Processes in Supply Chain Management and Supply Chain Metrics Best-Practice Business Processes in CRM Software
Chapter 10: E-commerce: Digital Markets, Digital Goods	E-commerce Challenges: The Story of Online Groceries Build an E-commerce Business Plan Hot New Careers in E-Commerce E-commerce Payment Systems Building an E-commerce Website
Chapter 11: Managing Knowledge	Challenges of Knowledge Management Systems
Chapter 12: Enhancing Decision Making	Building and Using Pivot Tables
Chapter 13: Building Information Systems	Unified Modeling Language Primer on Business Process Design and Documentation Primer on Business Process Management Fourth-Generation Languages
Chapter 14: Managing Projects	Capital Budgeting Methods for Information Systems Investments Enterprise Analysis (Business Systems Planning) and Critical Success Factors Information Technology Investments and Productivity

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Preface to The Indian Edition

Information systems are one of the major tools available to business managers for achieving operational excellence, developing new products and services, improving decision making, and achieving competitive advantage. There is a whole new world of doing business using new technologies for managing and organizing. What makes the MIS field the most exciting area of study in schools of business is the continuous change in technology, management, and business processes. A continuing stream of information technology innovations are transforming the traditional business world. Examples include the emergence of cloud computing, the growth of a mobile digital business platform based on smartphones and tablet computers, and not least, the use of social networks by managers to achieve business objectives. Most of these changes have occurred in the last few years.

New cases have been added to this edition namely ETMs re-routing KRSTC, collaboration for improved services at eClerx, NTT Datacenter, RFID enabled weighbridge automation, managing the supply chain to deliver McDonalds, Zomato scripting success with e-commerce, PayTM cashing on demonetization and KMS empowering Capella.

Compared to the industrial organization of the previous century, this new fast-growing 21st Century business firms put less emphasis on hierarchy and structure, and more emphasis on employees taking on multiple roles and tasks. They use social media to enter into conversations with consumers, and demonstrate a greater willingness to listen to consumers, in part because they have no choice. They show better understanding of the importance of information technology in creating and managing business firms and other organizations. To the extent organizations and business firms demonstrate these characteristics, they are 21st Century digital firms.

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About the Adapter

Sahil Raj is a faculty member at School of Management Studies, Punjabi University, Patiala. His main area of interest is the application of information systems in business organizations. Prior to his present organization, he had worked in Ranbaxy Laboratories Ltd. He holds an engineering degree as well as an MBA and a Ph.D. Sahil Raj has been regularly contributing research papers to national and international journals and has presented research papers in many

national and international conferences. He has already authored three books which includes Management Information System on Pearson Publication. He also actively contributes in various global edition books of Pearson. Presently, he is guiding research projects in the areas of artificial neural networks, business intelligence, strategic information systems, expert systems and big data analytics.

Organizations, Management, and the Networked Enterprise

Chapter 1

Information Systems in Global Business Today

Chapter 2

Global E-business and Collaboration

Chapter 3

Information Systems, Organizations, and Strategy

Chapter 4

Ethical and Social Issues in Information Systems

PART ONE introduces the major themes of this book, raising a series of important questions: What is an information system, and what are its management, organization, and technology dimensions? Why are information systems so essential in businesses today? Why are systems for collaboration and social business so important? How can information systems help businesses become more competitive? What broader ethical and social issues are raised by widespread use of information systems?

1

Information Systems in Global Business Today

Learning Objectives

After reading this chapter, you will be able to answer the following questions:

- 1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?
- 1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?
- 1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

CHAPTER CASES

Rugby Football Union Tries Big Data

Employee Pick-ups and Drop-offs at Convergys

ETM's Re-Routing KSTRC

The Domino's PULSE™ System: Reading the Pulse of the Customer

Rugby Football Union Tries Big Data

In 1871, twenty-one English clubs decided that their sport, officially called rugby union but commonly referred to simply as rugby, needed an administrative body. The clubs formed The Rugby Football Union (RFU), which today manages the English national team (England Rugby) in partnership with Premier Rugby Limited. Responsible for the promotion of rugby at all levels, the RFU organizes the Six Nations Championship, the unofficial northern hemisphere championship featuring teams from England, Scotland, Wales, Italy, Ireland, and France, and the Heineken Cup, its club-level counterpart. Owned by its member clubs, the RFU's mission is to maximize profits from international ticket sales and vending so that it can support the more than 60,000 volunteers who organize matches and seminars, help secure loans and insurance policies, fundraise, write grant proposals, provide medical advice and support, and perform the clerical duties that keep the lower-level clubs operating.

To succeed in this complicated mission, the RFU entered into a five-year deal with IBM to capture and analyze Big Data that will be useful to both fans, and later—it is hoped—the players themselves. The system is called TryTracker. In rugby, a try, worth five points, is the highest scoring opportunity. Teams get possession of the ball through a scrum, a contest for the ball where eight players bind together and push against eight players from the other team. The outcome determines who can control the ball. To score a try, a team must break through the opposition's defenses, move into their in-goal area, and "ground" the ball. This is done in one of two ways. A player



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can either hold the ball in one or both hands or arms and then touch it to the ground in the in-goal area, or exert downward pressure on a ball already on the ground using one or both hands or arms or the upper front of the body (from the neck to the waistline).

The IBM TryTracker does not just track tries, however. It uses predictive analytics to track three categories of data: keys to the game, momentum, and key players. TryTracker uses over 8,000 measures of performance. Traditional rugby statistics on team and individual performance as well as live text commentary complement the TryTracker data. The keys to the game are determined ahead of a specific contest by analyzing a historical database of past matchups between a pair. For example, in 2015 England's key was to average at least 3.2 meters per carry in the forwards; attempt an offload from 10 percent of opposition tackles; and make more than 66 percent of total line-breaks in the match. Fans can use their mobile devices to keep track of how their favorite team is faring, concentrating on game elements that will increase its winning chances. Key players for each team are selected after the game by comparing a single score compiled using different criteria for each position. Goal scoring is currently excluded so as not to overvalue kickers and undervalue players who contribute to creating scoring opportunities.

Like the IBM SlamTracker used at the Grand Slam tennis tournaments, the goal of TryTracker is to provide data visualization and real-time statistics to draw in fans. To compete with more popular sports such as Premier League football, the RFU hopes that enhanced communication will increase fan engagement. In 2015, IBM TryTracker was an ever-present fixture of EnglandRugby.com's extensive match coverage. As their understanding of game mechanics and emotional investment in what their team needs to do in order to prevail grows, casual fans will become dedicated fans who return again and again. Beyond marketing strategy, the long-term potential of predictive analysis is that it may provide tactical insights to players and coaches that will improve match play and thus the overall product offered to fans.

In 2016 IBM has deployed the same predictive analytics technology to the Australian New South Wales Waratahs Rugby team with an emphasis on predicting player injuries based on their general health, and performance data on the field generated from GPS sensors that players wear.

Sources: IBM, "Building a Solid Foundation for Big Data Analytics," IBM Systems Thought Leadership Paper, 2016; IBM, "IBM Predictive Analytics Reduces Player Injury and Optimises Team Performance for NSW Waratahs Rugby Team," IBM.com, accessed November 14, 2016; IBM, "3 Ways Big Data and Analytics Will Change Sports," by Preetam Kumar, IBM Analytics, ibmbigdatahub.com, December 17, 2015; Simon Creasey, "Rugby Football Union Uses IBM Predictive Analytics For Six Nations," ComputerWeekly.com, 2016; "About Us," rfu.com, accessed December, 14, 2015; "TryTracker: Rugby Data Analysis," *Telegraph*, November 19, 2015; Oliver Pickup, "How Does TryTracker Work," *Telegraph*, November 19, 2015; Simon Creasey, "Rugby Football Union Uses IBM Predictive Analytics for Six Nations," *ComputerWeek*, September 2015; "IBM Rugby Insight Summer 2015," MSN.com/sports, September 3, 2015; "Live England vs. Scotland with IBM TryTracker," www.englandrugby.com, March 15, 2015; "IBM TryTracker Confirms Performance," www.englandrugby.com/ibmtrytracker/, November 29, 2014; IBM UK, "IBM TryTracker Rugby

Insight: QBE Internationals 2014 England vs. Australia," *IBM Rugby Insight*, November 27, 2014; Oliver Pickup, "IBM TryTracker: How Does It Work?" *Telegraph*, October 31, 2013.

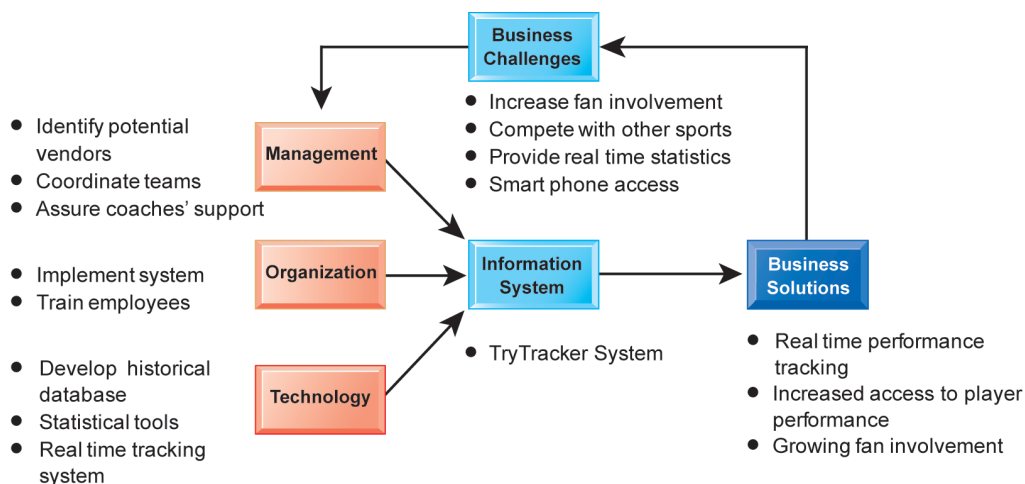
The challenges facing the RFU demonstrate why information systems are so essential today. The RFU is classified as a "Friendly Society," somewhere between a true company and a charity. It receives both government support and corporate sponsorship money. But it must maximize revenues from ticket sales, hospitality and catering, television rights, and its travel company in order to support both grassroots and elite rugby in England.

The chapter-opening diagram calls attention to important points raised by this case and this chapter. The RFU entered into a strategic partnership with IBM to educate and engage fans. Using the data collected by sports data company Opta and the analytics developed by IBM, it may also be able to improve coaching and game performance as an additional way of cultivating customers. IBM is also helping the RFU to develop a customer relationship management (CRM) system integrated with its Web site.

Here are some questions to think about: What role does technology play in the RFU's success as the administrative head of rugby union in England? Assess the contributions which these systems make to the future of RFU.

1-1 How are information systems transforming global business, and why are they so essential for running and managing a business today?

It's not business as usual in the global economy anymore. Information systems and technologies are transforming the global business environment. In 2015, global firms and governments spent about €3.4 trillion on information



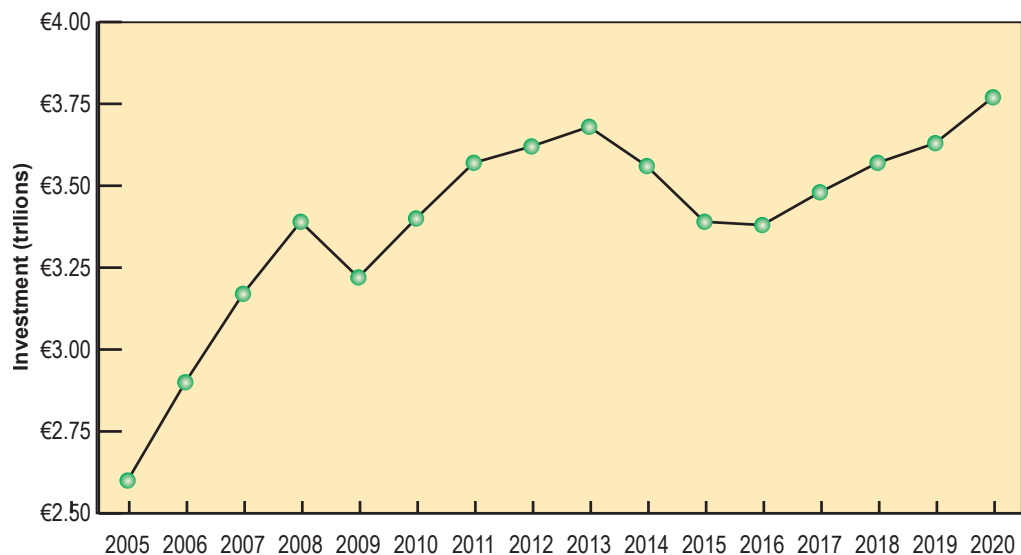
systems hardware, software, and telecommunications equipment. In addition, they spent another €544 billion on business and management consulting and services—much of which involves redesigning firms' business operations to take advantage of these new technologies (Gartner, 2016; IDC 2016; Shumsky, 2016). In fact, most of the business value of IT investment derives from these organizational, management, and cultural changes inside firms (Saunders and Brynjolfsson, 2016). It is not simply the technology that is changing. Figure 1.1 shows that between 2005 and 2015, global investment in information technology consisting of hardware, software, and communications equipment grew from €2.43 trillion to €3.18 trillion and is expected to expand to €3.55 trillion by 2020. While America and Europe account for an estimated 70 percent of this investment, 30 percent is occurring in Asia Pacific, Latin America, the Middle East and North Africa, and Eastern Europe. (Accelerance, 2016; IDC, 2016).

As managers, most of you will work for firms that are intensively using information systems and making large investments in information technology. You will certainly want to know how to invest this money wisely. If you make wise choices, your firm can outperform competitors. If you make poor choices, you will be wasting valuable capital. This book is dedicated to helping you make wise decisions about information technology and information systems.

How Information Systems Are Transforming Business

You can see the results of this large-scale spending around you every day by observing how people conduct business. Changes in technology and

FIGURE 1.1 INFORMATION TECHNOLOGY CAPITAL INVESTMENT



Global investment in information technology has expanded by 30 percent in the period 2005 to 2015. IT investment now accounts for an estimated 20 percent of all capital investment.

Source: World Economic Outlook, International Monetary Fund, October 2016; industry sources; author estimates.

new, innovative business models have transformed social life and business practices. Some 2.8 billion people worldwide have smartphones (50 percent of the world's population), and an estimated 1.26 billion use their smartphones for Internet access. More than 1 billion people use tablet computers, about 15 percent of the global population. In developing and emerging countries, phones and tablets are the primary means of access to the Internet (Pew Research, 2016; eMarketer, 2015). An estimated 2.34 billion people now use social networks, with Facebook accounting for 1.7 billion people alone. Messaging services like WhatsApp, Facebook Messenger, and Twitter collectively have over 2 billion monthly users. Smartphones, social networking, texting, e-mailing, and webinars have all become essential tools of business because that's where your customers, suppliers, and colleagues can be found (eMarketer, 2016a).

By June 2015, more than 150 million businesses worldwide had dot-com Internet sites registered (Curtis, 2015). In 2016 1.62 billion Internet users will purchase online, generating \$1.9 billion in sales. Half of these sales will be from mobile devices. While still only 8 percent of total retail global sales, online commerce is growing at 6 percent annually, three times the growth of traditional offline retail (eMarketer, 2016a). In 2015, FedEx moved about 11.5 million packages daily in 220 countries and territories around the world, mostly overnight, and the United Parcel Service (UPS) moved more than 18 million packages daily. Businesses are using information technology to sense and respond to rapidly changing customer demand, reduce inventories to the lowest possible levels, and achieve higher levels of operational efficiency. Supply chains have become more fast-paced, with companies of all sizes depending on just-in-time inventory to reduce their overhead costs and get to market faster.

In comparison with the 2.7 billion people who read a print newspaper, online newspapers are read by one billion people, growing at 10 percent annually, far faster than print newspapers (WPT, 2016; Conaghan, 2015). An estimated 1.7 billion people watch videos and feature films online, 100 million post to a blog everyday, and 250 million read a blog, creating an explosion of new writers and new forms of customer feedback that did not exist five years ago. Social networking site Facebook attracted more than 1.7 billion monthly visitors worldwide. Nearly all of the *Fortune* 2000 global firms now have Facebook pages, Twitter accounts, and Tumblr sites.

Global e-commerce and Internet advertising continue to expand. Google's online ad revenues surpassed €80 billion in 2016, and Internet advertising continues to grow at more than 20 percent a year, reaching more than €194 billion in revenues in 2016 (eMarketer, 2016c). That's about one-third of all advertising in the world.

These changes in information technology and systems, consumer behavior, and commerce have spurred the annual growth of digital information to over 5 exabytes every few days, roughly equivalent to all the libraries in existence (Pappas, 2016). A recent study concluded that the value of information flowing between countries has grown 45 times since 2005, and the value of this information now exceeds the value of goods and finance exchanged (McKenzie, 2016).

What's New in Management Information Systems

Plenty. In fact, there's a whole new world of doing business using new technologies for managing and organizing. What makes the MIS field the most exciting area of study in schools of business is the continuous change in technology, management, and business processes. Five changes are of paramount importance.

IT Innovations. A continuing stream of information technology innovations is transforming the traditional business world. Examples include the emergence of cloud computing, the growth of a mobile digital business platform based on smartphones and tablet computers, big data, business analytics, and the use of social networks by managers to achieve business objectives. Most of these changes have occurred in the past few years. These innovations are enabling entrepreneurs and innovative traditional firms to create new products and services, develop new business models, and transform the day-to-day conduct of business. In the process, some old businesses, even industries, are being destroyed while new businesses are springing up.

New Business Models. For instance, the emergence of online video services like Netflix for streaming, Apple iTunes, Amazon, and many others for downloading video has forever changed how premium video is distributed and even created. Netflix in 2016 attracted more than 75 million subscribers worldwide to what it calls the "Internet TV" revolution. Netflix has moved into premium TV show production with 30 original shows such as *House of Cards* and *Orange Is the New Black*, challenging cable and broadcast producers of TV shows, and potentially disrupting cable network dominance of TV show production. Apple's iTunes now accounts for 67 percent of movie and TV show downloads and has struck deals with major Hollywood studios for recent movies and TV shows. A growing trickle of viewers are unplugging from cable and using only the Internet for entertainment.

E-commerce Expanding. E-commerce generated about \$600 billion in revenues in 2016 and is estimated to grow to nearly \$900 billion by 2020. E-commerce is changing how firms design, produce, and deliver their products and services. E-commerce has reinvented itself again, disrupting the traditional marketing and advertising industry and putting major media and content firms in jeopardy. Facebook and other social networking sites such as YouTube, Twitter, and Tumblr along with Netflix, Apple Beats music service, and many other media firms exemplify the new face of e-commerce in the twenty-first century. They sell services. When we think of e-commerce, we tend to think of selling physical products. While this iconic vision of e-commerce is still very powerful and the fastest-growing form of retail in the United States, growing up alongside is a whole new value stream based on selling services, not goods. It's a services model of e-commerce. Growth in social commerce is spurred by powerful growth of the mobile platform: 80 percent of Facebook's users access the service from mobile phones and tablets. Information systems and technologies are the foundation of this new services-based e-commerce. Mobile e-commerce hit \$130 billion in 2016 and is growing at more than 30 percent a year.

INTERACTIVE SESSION: MANAGEMENT

Employee Pick-ups and Drop-offs at Convergys

Convergys is a leading provider of customer management solutions for organizations across India. It started business in 2009, when the Business Process Outsourcing (BPO) industry was still in its infancy. But owing to the sky-rocketing prices of real estate in Delhi, it decided to build its center outside the city. The Delhi National Capital Region (NCR) was still developing at that time and property prices were significantly more economical in Gurgaon as compared to Delhi. So, the firm decided to set up its main Indian headquarters in Gurgaon. But limited connectivity to this new place, coupled with poor residential facilities, proved to be a challenge for the employees of Convergys, who had to commute from Delhi to work. This led the management to announce pick-up and drop-off facilities for all its workers.

Coordinating the logistics of the pick-ups and drop-offs went well initially. But over a decade of aggressive expansions in operations, staff (now over 10,000 strong), as well as centers (with three facilities in Gurgaon, and one each in Bangalore, Thane, and Pune), Convergys had to arrange around 200 pick-ups and drops-offs every day.

In addition to the cost burden of this activity, the company had to deal with the challenges of managing the pick-ups and drop-offs. The transport desk manually decided on the shortest route for every ride so that employees could reach the offices in time for work. But with over 1,000 cabs sourced from 40 vendors, managing 44 different shift timings was a herculean task. Ipinder Singh, the technical director at Convergys, tried looking into some off-the-shelf software to see if they could meet his company's requirements. But even with the deployment of these software, Singh found that a lot of the tasks would have to be done manually. He finally decided to design a solution in-house.

In order to automate tasks, the processes involved with running the existing system needed to be understood. Every week, supervisors (over 100 in number) would send complete information about their team's shift timings, addresses, contact numbers, and leave status for the following week to the transport department. The team at this department sorted through

the sheets they received and made a plan for the coming week. The whole process was time consuming. Once the plan was frozen, no changes could be made unless the whole plan was overhauled. This meant that in case an employee took an unexpected leave, there was a problem. Moreover, if there was a change in the employee's address or phone number, or if an employee quit in the middle of a week, the pick-up vans would keep waiting for that employee, adding to the company's transportation expenses.

Ipinder Singh's team of developers built an automated application that had all the parameters and metrics preloaded in the system, so that it could generate costs by department and employee. He integrated the transport application with the human resource information system. This helped him get updated information regarding change in address, phone number, leave, or resignation status of employees. Further, Convergys automated a lot of the transport department's manual tasks. For example, earlier, cab drivers were required to fill out a sheet after every trip, stating the distance covered. The transport department would then enter this information into Excel sheets to compute the costs for the different types of vehicles. This function is now handled almost entirely by the new application.

In spite of all these developments, one pressing issue still remained. How to find the most optimal route for each of the cabs so that the staff can reach the office on time? There are two aspects to this question. First, considering that the vendors charge on the basis of the kilometers covered by their cars, going a longer route significantly increases the costs to company. Second, late arrival of employees to work translates to losses for the firm. So, it was imperative that Singh find a solution to the optimal route challenge as quickly as possible.

Ipinder Singh decided to buy a generic routing solution with 10–12 built-in algorithms, and layered it with a digital version of the Eicher world maps. The software was further customized by feeding in additional information about the cab capabilities, average speed on various roads, locations of employees, and so on. With all this done, the software could