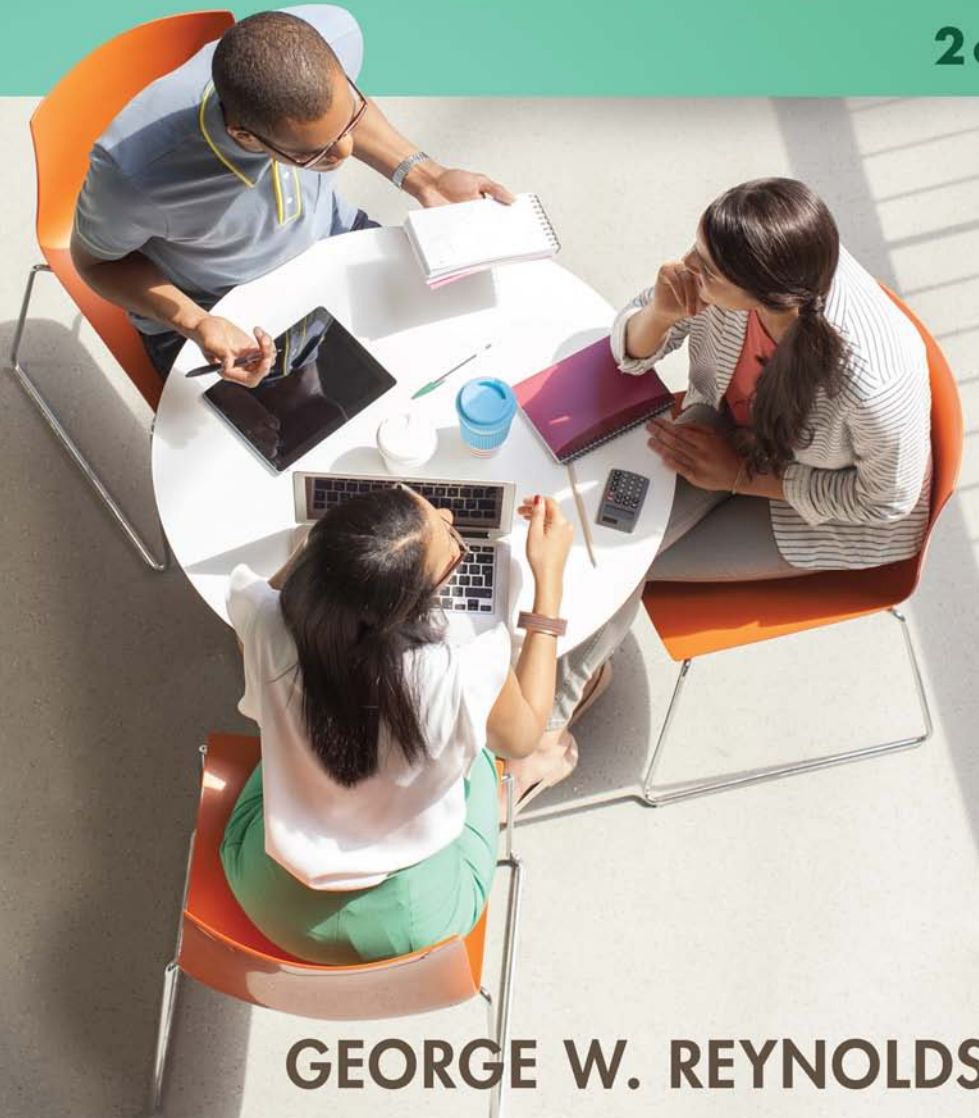


Information Technology FOR Managers

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GEORGE W. REYNOLDS

Information Technology **FOR** Managers

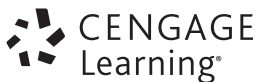
Information Technology FOR Managers

SECOND EDITION



George W. Reynolds

Strayer University



Australia • Brazil • Mexico • Singapore • United Kingdom • United States

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Second Edition**
George W. Reynolds

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*To my grandchildren: Michael, Jacob, Jared, Fievel, Aubrey,
Elijah, Abrielle, Sofia, Elliot, Serina, and Kendall*
—GWR

TABLE OF CONTENTS

Preface	xiii
Chapter 1 <i>Managers: Key to Information Technology Results</i>	1
The E-Borders Program	1
Why Managers Must Provide Leadership for Information Technology (IT)	1
Why Managers Must Understand IT	3
What Is Information Technology?	4
Personal IT	5
Group IT	6
Enterprise IT	7
The Role of Managers Vis-À-Vis IT	11
Identifying Appropriate IT Opportunities	12
Smooth Introduction and Adoption of IT	13
Ensuring That IT Risks Are Mitigated	18
What if Managers Do Not Participate in IT Projects?	19
Overview of Remaining Text	20
Key Terms	23
Chapter Summary	23
Discussion Questions	24
Action Needed	24
Web-Based Case	25
Case Study	25
Notes	28
Chapter 2 <i>Strategic Planning</i>	31
Apple's Innovative Business Strategy	31
Why Managers Must Understand the Relationship Between Strategic Planning and IT	33
Strategic Planning	33
Analyze Situation	35
Set Direction	37
Define Strategies	41
Deploy Plan	42
Setting the IT Organizational Strategy	43
Identifying IT Projects and Initiatives	45
Prioritizing IT Projects and Initiatives	46
Effective Strategic Planning: Chevron	47
Background	47
Situation Analysis	48
Set Direction	51
Define Strategies	52
Deploy Plan	52
Key Terms	57
Chapter Summary	57
Discussion Questions	57
Action Needed	58
Web-Based Case	59
Case Study	59
Notes	59

Chapter 3	<i>Project Management</i>	61
	The BBC Digital Media Initiative	61
	Why Managers Must Understand Project Management	63
	What Is a Project?	64
	Project Variables	64
	What Is Project Management?	69
	Project Management Knowledge Areas	69
	Scope Management	70
	Time Management	71
	Cost Management	72
	Quality Management	75
	Human Resource Management	76
	Communications Management	78
	Risk Management	80
	Procurement Management	83
	Project Integration Management	85
	Key Terms	87
	Chapter Summary	87
	Discussion Questions	88
	Action Needed	89
	Web-Based Case	89
	Case Study	90
	Notes	92
Chapter 4	<i>Business Process and IT Outsourcing</i>	95
	Salesforce.com and Its Cloud-Based Success	95
	Why Managers Must Understand Outsourcing	97
	What Are Outsourcing and Offshore Outsourcing?	98
	Why Do Organizations Outsource?	99
	Issues Associated with Outsourcing	102
	IT Outsourcing	105
	Public Cloud Computing	105
	Virtualization	108
	Autonomic Computing	108
	Private Cloud Computing	109
	Hybrid Cloud Computing	109
	Planning an Effective Outsourcing Process	109
	Establish a “Smart” Outsourcing Strategy	111
	Evaluate and Select Appropriate Activities and Projects for Outsourcing	111
	Evaluate and Select Appropriate Service Providers	112
	Evaluate Service Provider Locations	113
	Benchmark Existing Service Levels	114
	Define the Service-Level Agreement	115
	Develop an Outsourcing Contract	116
	Establish an Outsourcing Governance Process	116
	Measure and Evaluate Results	117
	Key Terms	119
	Chapter Summary	119
	Discussion Questions	120
	Action Needed	121
	Web-Based Case	121
	Case Study	122
	Notes	125

Chapter 5	<i>Corporate and IT Governance</i>	129
	Credit and Debit Card Theft	129
	Why Managers Must Get Involved in IT Governance	129
	What Is IT Governance?	131
	Ensuring That an Organization Achieves Good Value from Its Investments in IT	133
	Mitigating IT-Related Risks	134
	Why Managers Must Understand IT Governance	137
	IT Governance Frameworks	137
	IT Infrastructure Library (ITIL)	139
	Control Objectives for Information and Related Technology (COBIT)	140
	Using PDCA and an IT Governance Framework	142
	Business Continuity Planning	144
	Process for Developing a Disaster Recovery Plan	148
	Key Terms	153
	Chapter Summary	153
	Discussion Questions	154
	Action Needed	154
	Web-Based Case	155
	Case Study	155
	Notes	158
Chapter 6	<i>Collaboration Tools</i>	161
	Eagle Investment Employs Unified Communications	161
	Why Managers Must Understand Collaboration Tools	164
	Collaboration Tools	164
	Electronic Bulletin Boards	164
	Blogs	165
	Calendaring Software	168
	Desktop Sharing	168
	Instant Messaging (IM)	169
	Podcasts	170
	Really Simple Syndication (RSS)	171
	Shared Workspace	171
	Online Project Management	171
	Web Conferencing, Webinars, and Webcasts	172
	Wikis	175
	Presence Information	176
	Unified Communications (UC)	176
	Key Terms	179
	Chapter Summary	179
	Discussion Questions	180
	Action Needed	180
	Web-Based Case	181
	Case Study	181
	Notes	183
Chapter 7	<i>E-commerce</i>	185
	Alibaba Opening the Door to the Largest Domestic Retail Market in the World	185
	Why Managers Must Understand E-Commerce	187
	Forms of E-Commerce	189
	Business-to-Business (B2B) E-Commerce	189
	Business-to-Consumer (B2C) E-Commerce	192
	Consumer-to-Consumer (C2C) E-Commerce	194
	E-Government Commerce	194
	Mobile Commerce	196

E-Commerce Critical Success Factors	198
Identifying Appropriate E-Commerce Opportunities	198
Acquiring Necessary Organizational Capabilities	198
Directing Potential Customers to Your Site	200
Providing a Good Customer Online Experience	201
Providing an Incentive for Customers to Purchase and Return in the Future	201
Providing Timely, Efficient Order Fulfillment	202
Offering a Variety of Easy and Secure Payment Methods	203
Handling Returns Smoothly and Efficiently	205
Providing Effective Customer Service	205
Advantages of E-Commerce	206
Issues Associated with E-Commerce	207
Customers Fear That Their Personal Data May Be Stolen or Used Inappropriately	207
Cultural and Linguistic Obstacles	208
Difficulty Integrating Web and Non-Web Sales and Inventory Data	208
Key Terms	210
Chapter Summary	210
Discussion Questions	211
Action Needed	212
Web-Based Case	212
Case Study	213
Notes	215
Chapter 8 <i>Enterprise Systems</i>	219
Coca-Cola: Global Reach Through Local Distribution	219
What Is an Enterprise System?	222
Enterprise Resource Planning	222
Benefits of Using an ERP System	225
Tier I, Tier II, and Tier III ERP Vendors	228
ERP Customization	229
Supply Chain Management (SCM)	230
Customer Relationship Management	232
Product Life Cycle Management (PLM)	236
Avoiding Enterprise Systems Failures	240
Hosted Software Model for Enterprise Software	241
Key Terms	244
Chapter Summary	244
Discussion Questions	245
Action Needed	246
Web-Based Case	246
Case Study	247
Notes	249
Chapter 9 <i>Business Intelligence and Big Data</i>	253
Amazon: Beating the In-Store Advantage with Business Intelligence	253
What Is Business Intelligence?	255
Data Warehouse/Data Marts	256
Big Data	258
Structured and Unstructured Data	259
Business Intelligence Tools	263
Spreadsheets	264
Reporting and Querying Tools	265
Online Analytical Processing (OLAP)	265
Drill-Down Analysis	266

Data Mining	267
Dashboards	268
Data Governance	269
Challenges of Big Data	272
Key Terms	275
Chapter Summary	275
Discussion Questions	276
Action Needed	277
Web-Based Case	277
Case Study	278
Notes	281
Chapter 10 <i>Knowledge Management</i>	285
How Knowledge Management Is Helping Nelnet Service Student Loans	285
What Is Knowledge Management (KM)?	287
Knowledge Management Applications and Associated Benefits	289
Best Practices for Selling and Implementing a KM Project	290
Technologies That Support KM	292
Communities of Practice	293
Social Network Analysis (SNA)	293
Web 2.0 Technologies	295
Business Rules Management Systems	295
Enterprise Search Software	297
Key Terms	300
Chapter Summary	300
Discussion Questions	301
Action Needed	302
Web-Based Case	302
Case Study	302
Notes	305
Chapter 11 <i>Cybercrime and IT Security</i>	307
Health Data Cybertheft: The Plunder of Anthem	307
Why Managers Must Understand IT Security	309
Why Computer Incidents Are So Prevalent	309
Types of Exploits	313
Federal Laws for Prosecuting Computer Attacks	324
Implementing Trustworthy Computing	325
Risk Assessment	326
Establishing a Security Policy	327
Educating Employees and Contract Workers	329
Prevention	329
Detection	333
Response	333
Key Terms	339
Chapter Summary	339
Discussion Questions	340
Action Needed	341
Web-Based Case	342
Case Study	342
Notes	345

Chapter 12	<i>Ethical, Legal, and Social Issues of Information Technology</i>	349
	Artificial Intelligence: Robots on the Rise	349
	What Is Ethics?	352
	The Difference Between Morals, Ethics, and Laws	352
	Including Ethical Considerations in Decision Making	353
	Privacy	355
	Data Brokers	360
	Treating Customer Data Responsibly	360
	Workplace Monitoring	362
	Social Networking and Privacy	364
	Internet Censorship	367
	Internet Access	368
	The Digital Divide	369
	E-Rate Program	370
	Net Neutrality	370
	Internet of Things	371
	Key Terms	376
	Chapter Summary	376
	Discussion Questions	378
	Action Needed	378
	Web-Based Case	379
	Case Study	379
	Notes	382
Glossary		387
Index		401

Why This Text?

The undergraduate capstone course on information technology and the MBA level information technology course required of College of Business graduates are two of the most challenging courses in the business curriculum to teach. Students in both courses often start the term skeptical of the value of such a course. Indeed, “Why do I need to take this course?” is frequently their attitude. Unfortunately, this attitude is only perpetuated by most texts, which take the approach of “Here is a lot of technical stuff you have to understand.” As a result, students complete the course without getting as much from it as they could. The instructors of such courses are disappointed, receive poor student evaluations, and wonder what went wrong. An opportunity to deliver an outstanding and meaningful course has been missed.

Information Technology for Managers, 2nd edition, takes a fundamentally different approach to this subject in three ways. First, it is targeted squarely at future managers, making it clear why IT does indeed matter to them and the organization. Second, it enables future business managers to understand how information technology can be applied to improve the organization. Third, it provides a framework for business managers to understand their important role vis-à-vis information technology. Said another way, *Information Technology for Managers*, 2nd edition, answers three basic questions—Why do I need to understand IT? What good is IT? What is my role in delivering results through the use of IT?

Approach of This Text

Information Technology for Managers, 2nd edition, is intended for future managers who are expected to understand the implications of IT, identify and evaluate potential opportunities to employ IT, and take an active role in ensuring the successful use of IT within the organization. Thoroughly updated, the text is also valuable for future IT managers who must understand how IT is viewed from the business perspective and how to work effectively with all members of the organization to achieve IT results.

Organization and Coverage in the 2nd Edition

Chapter 1: Managers: Key to Information Technology Results presents a clear rationale for why managers must get involved in information technology strategic planning and project implementation. The chapter helps managers identify what they must do to advance the effective use of IT within their organizations, and it helps them understand how to get involved with IT at the appropriate times and on the appropriate issues, as demonstrated by new examples from Walmart, Avon, Ellie Mae, and more.

Chapter 2: Strategic Planning describes how to develop effective strategic planning by defining key business objectives and goals, which are used to identify a portfolio of

potential business projects that are clearly aligned with business needs, as illustrated by the new opening vignette featuring Apple, Inc. Further refinement is required to narrow the portfolio to the projects that should be executed and for which sufficient resources are available. This process is illustrated by the example of Chevron, a major global organization respected for its highly effective use of IT to support business objectives.

Chapter 3: Project Management provides a helpful overview of the project management process. The presentation is consistent with the Project Management Institute's Body of Knowledge, an American National Standard. The chapter describes the nine project management knowledge areas of scope, time, cost, quality, human resources, communications, risk, procurement, and integration. This chapter identifies the many roles a business manager might take throughout the project life cycle, including champion, sponsor, project manager, subject matter expert, project team member, and end user, whether in private enterprise, such as Vermont Health Connect, or government facilities, such as the National Audit Office of the United Kingdom or the Russian Olympic committee.

Chapter 4: Business Process and IT Outsourcing discusses the major business reasons for outsourcing as well as many of its potential pitfalls. It also outlines and describes an effective process for selecting an outsourcing firm and successfully transitioning work to the new organization. The chapter provides a thorough discussion of cloud computing as an example of IT outsourcing. Using current examples from Supervalu, Amazon, and others, the chapter covers the importance of establishing service-level agreements and monitoring performance.

Chapter 5: Corporate and IT Governance describes the responsibilities and practices that a company's executive management uses to ensure delivery of real value from IT and to ensure that related risks are managed appropriately, all brought to life with real-world examples from Home Depot, Target, and Michaels. The chapter covers two frameworks for meeting these objectives: the IT Infrastructure Library (ITIL) and Control Objectives for Information and Related Technology (COBIT). The discussion includes related issues such as mitigating IT-related risks, use of the PDCA model to improve IT governance, and business continuity planning.

Chapter 6: Collaboration Tools identifies and discusses the variety of collaboration tools that managers can use to improve communications and enhance productivity, such as blogs, Webinars, and wikis. It also discusses the benefits and some of the issues that can arise from their use, as demonstrated by the opening vignette about Eagle Investment Systems.

Chapter 7: E-Commerce discusses the use of electronic business methods to buy and sell goods and services, interact with customers, and collaborate with business partners and government agencies. Several forms of e-business are covered, including business-to-business (B2B), business-to-consumer (B2C), consumer-to-consumer (C2C), and e-government commerce. The chapter also covers m-commerce, an approach to conducting e-commerce in a wireless environment. The chapter prepares managers to understand and deal with many of the business, legal, and ethical issues associated with e-business, and contemporary examples like Alibaba and Amazon reinforce the international reach of e-commerce.

Chapter 8: Enterprise Systems discusses enterprise planning, customer relationship, and product life cycle management systems used to ensure that business transactions are processed efficiently and accurately and that the resulting information can be accessed by end users and managers in all business areas. Including references to Coca-Cola, IBM, and

others, it identifies several of the benefits associated with enterprise system implementation, outlines measures to take to avoid enterprise system failures, and describes the hosted software model for enterprise software. The chapter also explains the key role that business managers play in successfully implementing enterprise systems.

Chapter 9: Business Intelligence and Big Data discusses a wide range of applications that help businesses gather and analyze data to improve decision making at organizations like Amazon and Memorial Sloan Kettering Cancer Center, including spreadsheets, reporting and querying tools, online analytical processing, drill-down analysis, data mining, and dashboards. The chapter also covers many big data topics, including structured and unstructured data, ACID properties, NoSQL Databases, Hadoop, in-memory databases, and data governance. The challenges associated with business intelligence systems and big data are also discussed as well as the role of the business manager in developing and using these systems.

Chapter 10: Knowledge Management describes explicit and tacit information and how organizations like NASA and Nelnet use knowledge management to identify, select, organize, and disseminate that information. In this chapter, you will learn about techniques for capturing tacit knowledge, communities of practice, social network analysis, Web 2.0 technologies, business rules management systems, and enterprise search. The chapter also covers how to identify and overcome knowledge management challenges, and it includes a set of best practices for selling and implementing a knowledge management project.

Chapter 11: Cybercrime and IT Security discusses commonly occurring computer-related security incidents (using recent examples from Anthem and Sony), describes why computer incidents are so prevalent, identifies various perpetrators of computer crime, offers a computer security self-assessment test, describes types of exploits, outlines various federal laws for prosecuting computer attackers, and describes how to implement trustworthy computing, including specific tasks to prevent, detect, and respond to computer security incidents.

Chapter 12: Ethical, Legal, and Social Issues of Information Technology provides a brief overview of ethics and how to include ethical considerations in decision making. A variety of topics related to privacy, freedom of expression versus censorship, and Internet access—all based on current situations from Verizon, Zendesk, and more—are discussed from the perspective of what managers need to know about these topics.

Chapter Features

Opening Vignette: Business majors and MBA students often have difficulty appreciating why they need to comprehend IT or what their role (if any) is vis-à-vis IT. In recognition of this, each chapter begins with an opening vignette that raises many of the issues that will be covered in the chapter. The vignette touches on these topics in such a way as to provide a strong incentive to the student to read further in order to gain clarity regarding the potential impact of IT on the business as well as management's responsibility in relation to IT.

Learning Objectives: A set of learning objectives follows the opening vignette and provides a preview of the major themes to be covered in the chapter.

Real-World Examples: In an effort to maintain the interest and motivation of the reader, each chapter includes numerous real-world examples of business managers

struggling with the issues covered in the chapter—some successfully, some unsuccessfully. The goal is to help readers understand the manager’s role in relation to information technology and to discover key learnings they can apply within their organizations.

What Would You Do: This special feature presents realistic scenarios that encourage students to think critically about the concepts presented in the chapter. There are three of these features placed appropriately in each chapter to cause the reader to reflect on the topics just covered.

A Manager’s Checklist: Each chapter contains a valuable set of guidelines for future business managers to consider as they weigh IT-related topics, including how they might use IT in the future within their organization.

Chapter Summary: Each chapter includes a helpful summary that highlights the managerial implications and key technical issues of the material presented.

Discussion Questions: A set of thought-provoking questions to stimulate a deeper understanding of the topics covered in the chapter.

Action Needed: Each chapter includes three mini-cases requiring a decision or response from the reader. These mini-cases provide realistic scenarios and test the student’s knowledge, insight, and problem-solving capability.

Web-Based Case: Each chapter includes an “open-ended” case that requires students to gather their own research information and do some critical thinking to address the questions raised in the case.

Case Study: Each chapter ends with a challenging real-world case of managers struggling with the issues covered in the chapter. These cases are unique because they look at IT from a manager’s perspective, not from an IT technologist’s point of view.

INSTRUCTOR RESOURCES

The teaching tools that accompany this text offer many options for enhancing a course. As always, we are committed to providing one of the best teaching resource packages available in this market.

Instructor’s Manual

An *Instructor’s Manual* provides valuable chapter overviews, chapter learning objectives, teaching tips, quick quizzes, class discussion topics, additional projects, additional resources, and key terms. It also includes solutions to all end-of-chapter discussion questions, exercises, and case studies.

Test Bank and Test Generator

Cognero® is a powerful objective-based test generator® that enables instructors to create paper-, LAN- or Web-based tests from test banks designed specifically for their Course Technology text.

PowerPoint Presentations

A set of Microsoft PowerPoint slides is available for each chapter. These slides are included to serve as a teaching aid for classroom presentation. The presentations help

students focus on the main topics of each chapter, take better notes, and prepare for examinations. The slides are fully customizable. Instructors can either add their own slides for additional topics they introduce to the class or delete slides they won't be covering.

CourseMate

Engaging and affordable, the new Information Technology for Managers CourseMate Web site offers a dynamic way to bring course concepts to life with interactive learning, study, and exam preparation tools that support this printed edition of the text. Watch student comprehension soar with flash cards, games, and quizzes that help them prepare for exams. A complete e-book provides you with the choice of an entire online learning experience. Information Technology for Managers CourseMate goes beyond the book to deliver what students need.

ACKNOWLEDGMENTS

I want to thank all of the folks at Cengage Learning for their role in bringing this text to market. I offer many thanks to Mary Pat Shaffer, my wonderful development editor, who deserves special recognition for her tireless efforts and encouragement. Thanks also to the many people who worked behind the scenes to bring this effort to fruition, including Joe Sabatino, product director and Jason Guylar, product manager. Special thanks to Jennifer King, the content development manager, and Anne Merrill, the content developer, for coordinating the efforts of the team of many people involved in this project and for keeping things moving forward.

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TO MY REVIEWERS

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MY COMMITMENT

I welcome your input and feedback. If you have any questions or comments regarding *Information Technology for Managers*, 2nd edition, please contact me through Course Technology at www.cengage.com or through your local representative.

George W. Reynolds

MANAGERS: KEY TO INFORMATION TECHNOLOGY RESULTS

PROVIDING LEADERSHIP

“A leader takes people where they want to go. A great leader takes people where they don’t necessarily want to go, but ought to be.”

—Rosalynn Carter, former First Lady of the United States

THE E-BORDERS PROGRAM

Why Managers Must Provide Leadership for Information Technology (IT)

In late August 2014, the British government raised the terror threat level for the United Kingdom to four—or “severe.” According to the government, at least 500 British citizens had recently left the United Kingdom and traveled to Syria or Iraq to join the Islamic fundamentalist militant group ISIL (also known as ISIS and the Islamic State), which had conquered large swaths of territory in the Middle East. The government suspected that many of those citizens were being trained to return to the United Kingdom to carry out terrorist attacks. The British government’s chief defense strategy against this threat lay in border control—preventing U.K. citizens from flying out of the country to

join ISIL, canceling the citizenship of those U.K. residents who were already fighting for ISIL, and apprehending ISIL trainees returning to the United Kingdom.

In 2003, anticipating the need for tighter border control, the British government launched the e-Borders project. The main objective of the program was to collect information about all scheduled inbound and outbound passengers in advance of travel. This data would then be used to prevent passengers considered a threat from entering or leaving the country, arrest terrorist and organized crime suspects, and improve passenger clearance times. In March 2014, the government canceled the project at a cost of £224 million (\$350 million) to British taxpayers. An evaluation of the e-Borders program in 2013 had determined that while the IT system supporting the program had been effectively deployed at London's Heathrow Airport, the system had failed in the maritime and rail sectors. The effective elements of the e-Borders system were subsequently merged into the new Border Systems Programme with the hope that the capabilities of this system would be expanded.

Many factors contributed to the failure of the e-Borders program to fulfill all its initial goals. A British court eventually determined that the responsibility for the failure lay primarily with the U.K. Border Agency and not the vendor Raytheon. Specifically, the U.K. Border Agency did not establish appropriate benchmarks to track the project's progress, and it did not engage competent subject matter experts during the procurement of resources. Finally, the agency did not define and stabilize requirements, resulting in changing goals and an underestimation of the complexity of the project. Bottom line, there was a failure of management to provide strong leadership for the effort.

The e-Borders project did, however, enjoy some success. The police were able to locate and arrest thousands of wanted individuals identified by the system. Unfortunately, one evaluation reported that the e-Borders program was collecting a mere 65 percent of data on incoming and

outgoing passengers in advance of their travel. The ability of the new Border Systems Programme to extend the collection and analysis of this data will be critical as the United Kingdom faces future threats posed by ISIL and other terrorist and criminal organizations.

LEARNING OBJECTIVES

As you read this chapter, ask yourself:

- Why must managers understand critical principles of IT system development and provide leadership for these projects?
- Am I prepared to get involved with IT at the appropriate times and on appropriate issues?

This chapter provides a working definition of information technology, discusses the essential role of managers in ensuring good results from various types of IT systems, and warns of the dire consequences that can follow when managers fail to meet these responsibilities. But first we will answer the question—why should managers understand IT?

WHY MANAGERS MUST UNDERSTAND IT

Why learn about information technology? Isn't this area of the business best left to the IT professionals, and not managers? The answer is a simple, emphatic *No*. This section provides several reasons why managers must understand IT and why they must lead the effort to decide what IT to invest in and how to use it most effectively.

New IT business opportunities, as well as competitive threats, are coming at a faster and faster rate. Managers play a key role—they must frame these opportunities and threats so others can understand them, prioritize them in order of importance, and evaluate proposed solutions. Finally, managers must lead the effort to define IT strategies and policies that best meet organizational needs.

Even if two different companies invest in the same IT systems from the same vendors, the organizations will not necessarily end up with identical solutions or use the systems in the same ways. As a result, one firm may profit greatly from an IT deployment while another struggles with unsatisfactory results. Managers, working in conjunction with IT specialists, must make many decisions when implementing a new IT solution, including how broad the project will be in scope, what data to capture, how databases and applications should be tailored, what information will flow from the systems and to whom, and, most importantly, how people will use the system to make a difference.

True productivity improvements seldom come simply from automating work processes. Real gains in productivity require innovations to business practices and then automating these improved processes to take advantage of IT capabilities. Companies that merely insert IT into their operations without making changes that exploit the new IT capabilities will not capture significant benefits. Managers are the key to ensuring that IT innovations pay off; they must lead a holistic approach that includes encouraging the acceptance of change, addressing changes in business processes and organizational structure, establishing new employee roles and expectations, and creating new measurement and reward systems.

To gain a sustainable competitive advantage, companies must consistently deliver increasing value to customers. Doing so requires essential information gained through the effective use of IT that better defines customers and their needs. This information can help companies improve products and develop better customer service, leading to sustained increases in revenue and profits. Managers must recognize the value of this information, know how to communicate their needs for it, and be able to work with IT staff to build effective IT systems that make useful information available.

In a rapidly changing global business environment, managers require lifelong learning and flexibility in determining their business roles and career opportunities. Given the widespread use of IT, managers must be able to understand how technology affects their industry and the world at large.

WHAT IS INFORMATION TECHNOLOGY?

Information technology (IT) includes all tools that capture, store, process, exchange, and use information. The field of IT includes computer hardware, such as mainframe computers, servers, desktops, laptops, tablets, and smartphones; software, such as operating systems and applications for performing various functions; networks and related equipment, such as modems, routers, and switches; and databases for storing important data.

An organization's defined set of IT hardware, software, and networks is called its **IT infrastructure**. An organization also requires a staff of people called its **IT organization** to plan, implement, operate, and support IT. In many firms, some or all IT support may be outsourced to another firm.

An organization's IT infrastructure must be integrated with employees and procedures to build, operate, and support **information systems** that enable a firm to meet fundamental objectives, such as increasing revenue, reducing costs, improving decision making, enhancing customer relationships, and speeding up its products' time to market.

Most organizations have a number of different information systems. When considering the role of business managers in working with IT, it is useful to divide information systems into three types: personal IT, group IT, and enterprise IT. Figure 1-1 shows the relationship among IT support staff, IT infrastructure, and the various types of information systems. These systems are explained in the following sections.

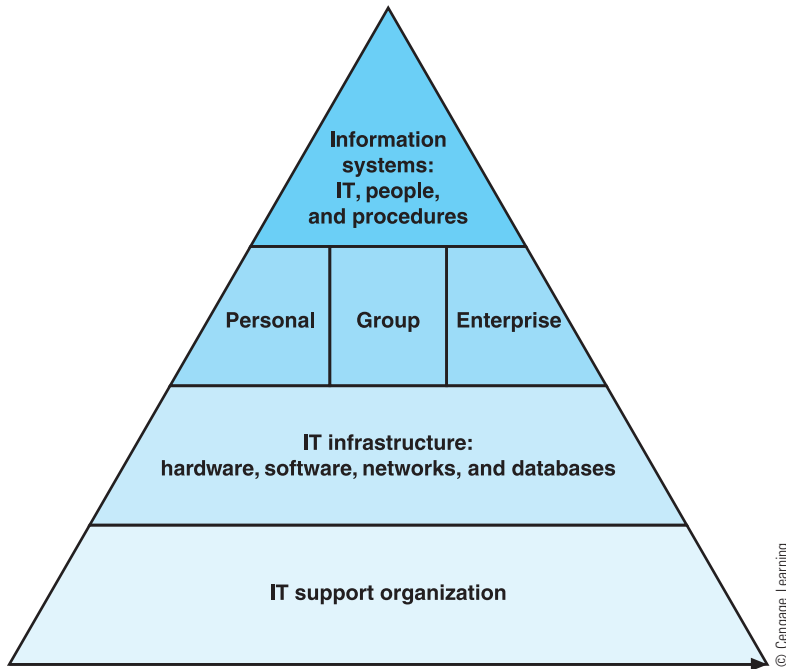


FIGURE 1-1 IT infrastructure supports personal, group, and enterprise information systems

Personal IT

Personal IT includes information systems that improve the productivity of individual users in performing stand-alone tasks. Examples include personal productivity software such as word processing, presentation, and spreadsheet software; decision support systems, and online learning systems.

A **decision support system (DSS)** employs analytic models to help users gain insights into a problem situation, examine alternative solutions, and recommend an appropriate course of action. For example, VisualDx is a clinical decision support system that provides instant access to concise disease information and high-quality medical images. Its database encompasses more than 1300 medical conditions and nearly 30,000 images. Physicians can search this database by symptoms, visual clues, and other patient factors to diagnose diseases and develop treatment plans. The system can be downloaded as an app that runs on a smartphone or it can be accessed via desktop computer or laptop.¹

Online learning systems encompass a number of computer-enhanced learning techniques, including computer-based simulations, multimedia DVDs, Web-based learning materials, hypermedia, podcasts, and Webcasts. Such use of information systems qualifies as an example of personal IT. With the rapid changes in today's business environment, managers and employees must be continual learners to keep pace. For example,

Avanade is a global IT consulting company with over 21,000 professionals spread across 70 locations in 20 countries. Its clients expect the company's assigned consultants to be well-trained, competent advisors with a broad set of consulting skills and deep domain-specific skills. Avanade University is an online hub for employees to access the training they need anytime, anywhere. Avanade consultants spend an average of 80 hours per year on education with a focus on various technical and management topics, language education, and more.²

Group IT

In today's fast-moving global work environment, success depends on our ability to communicate and collaborate with others, including coworkers, colleagues, clients, and customers. **Group IT** includes information systems that improve communications and support collaboration among members of a workgroup. Examples include the use of Web conferencing, wikis, and electronic corporate directories.

Web conferencing uses IT to conduct meetings or presentations in which participants are connected via the Internet. Screen sharing is the most basic form of Web conference—each participant sees whatever is on the presenter's screen, be it a spreadsheet, legal document, artwork, blueprint, or MRI image. Conference participants can communicate via voice or text. Another form of Web conferencing is Webcasting, in which audio and video information is broadcast from the presenter to participants. Still another type of Web conference, a Webinar, is a live Internet presentation that supports interactive communications between the presenter and the audience.

One company that makes effective use of Web conferencing is Heritage Log Homes, a producer of log homes with 30 employees and 70 independent dealers across North America. The firm offers a variety of standard layouts within five basic styles of log homes; however, 90 percent of its projects are custom homes. The customization process used to be quite lengthy, involving mailing engineering drawings back and forth between the design team and the customer. Each would take turns marking up the drawings with their suggested changes. Finalizing the plans typically took months. Heritage moved to a real-time collaboration system using the GoToMeeting Web conferencing system, which allows the architect and the customer to review the house plans together—identifying design ideas, discussing issues, and incorporating changes into the design. In this manner, it is possible to finalize a design in just a few sessions over a week or two.³ The improved process has increased customer satisfaction and greatly improved the cash flow for Heritage Log Homes.

A **wiki** (Hawaiian for *fast*) is a Web site that allows users to edit and change its content easily and rapidly. The wiki may be either a hosted Internet site or a site on a company's intranet. A wiki enables individual members of a workgroup or project team to collaborate on a document, spreadsheet, or software application without having to send the materials back and forth. FFmpeg is a free software project that produces libraries and programs for handling multimedia data. FFmpeg adopted the use of Trac, an enhanced wiki and issue tracking system, in June 2014 to provide support for software developers.⁴

Electronic corporate directories are used in large organizations to find the right person with whom to collaborate on an issue or opportunity. Increasingly, organizations are creating online electronic corporate directories to solve this problem. IBM created an application called Bluepages—IBM’s Facebook for the enterprise. This group IT application enables an employee to contact other employees and their backups, in case of an absence or vacation. The application was recently made available as a mobile app running on IBM’s WhirlWind infrastructure, which supports Apple, Android, and BlackBerry smartphones and can be downloaded to an employee’s smartphone.⁵

Enterprise IT

Enterprise IT includes information systems that organizations use to define structured interactions among their own employees and/or with external customers, suppliers, government agencies, and other business partners. Successful implementation of these systems often requires the radical redesign of fundamental work processes and the automation of new processes. Target processes may include purely internal activities within the organization (such as payroll) and those that support activities with external customers and suppliers. Three examples of enterprise IT are transaction processing, enterprise, and interorganizational systems.

A **transaction processing system (TPS)** captures data from company transactions and other key events, and then updates the firm’s records, which are maintained in electronic files or databases. Each TPS supports a specific activity of the firm, and several may work together to support an entire business process. For example, some organizations use many TPSs to support their order processing, which includes order entry, shipment planning, shipment execution, inventory control, and accounts receivable, as shown in Figure 1-2. The systems work together in the sense that data captured by an “upstream” system is passed “downstream” and made available to other systems later in the order processing cycle. Data captured using the order entry TPS is used to update a file of open orders—orders received but not yet shipped. The open order file, in turn, is used as input to the shipment planning TPS, which determines the orders to be filled, the shipping date, and the location from which each order will be shipped. The result is the planned order file, which is passed downstream to the shipment execution TPS, and so on.

Many organizations employ **enterprise systems** to support their operation and planning functions and to enable the sharing of information across all business functions and all levels of management. These systems employ a database of key operational and planning data that can be shared by all employees and, in some situations, customers and suppliers. The three most common types of enterprise systems are:

- Enterprise resource planning (ERP) systems that support supply chain processes, such as order processing, demand planning, inventory management, and purchasing
- Customer relationship management (CRM) systems that support sales, marketing, and customer service processes

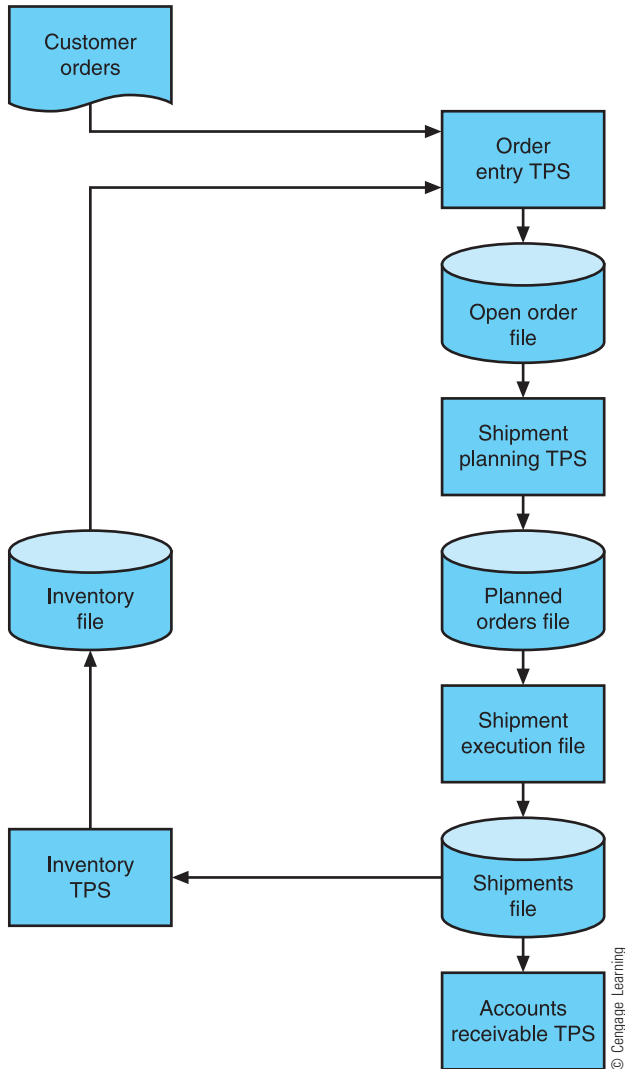
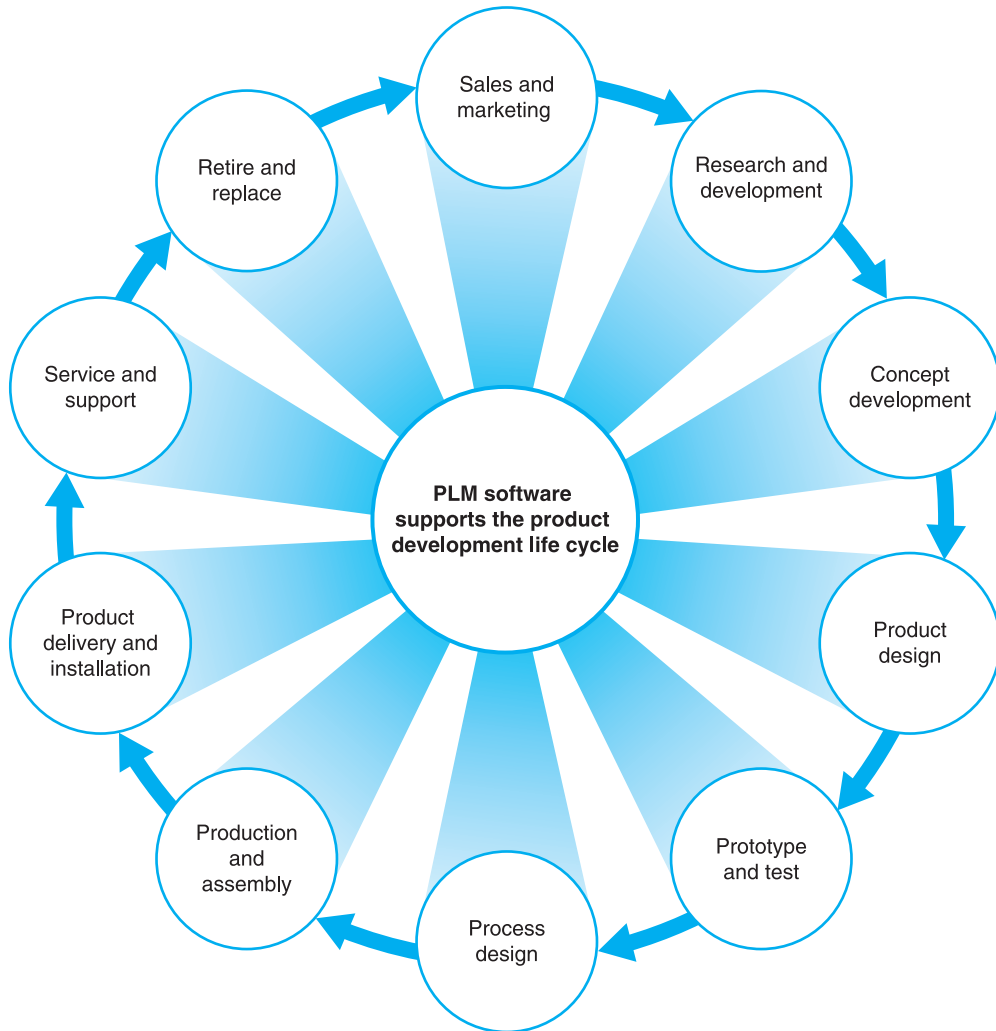


FIGURE 1-2 TPS systems that support order capture and fulfillment

- Product life cycle management (PLM) systems that support the processes associated with the various phases of the life cycle of a product, including sales and marketing, research and development, concept development, product design, prototyping and testing, manufacturing process design, production and assembly, delivery and product installation, service and support, and product retirement and replacement; see Figure 1-3 for an overview of the scope of PLM software.



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FIGURE 1-3 Scope of PLM software

CSX Corporation operates 21,000 miles of railway in 23 states across the United States. Recently, the firm began a CRM implementation project to improve its local operations service. This required a team effort with participation from trainmasters, sales, and marketing to gather key data about some 5000 customer work sites. The data includes the customer's site location in CSX's maps, track infrastructure characteristics, and service challenges as well as information about the customer's operations. Loading this data into its CRM system enables CSX employees to better manage their sales efforts, more closely meet customers' needs, and enhance customer communication.⁶

Interorganizational information systems support the flow of data among different organizations to achieve shared goals. For example, some organizations need to share data