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INTRODUCTION TO INFORMATION SYSTEMS

SUPPORTING AND TRANSFORMING BUSINESS

FIFTH CANADIAN EDITION

WILEY

Introduction to Information Systems

Supporting and Transforming Business

Fifth Canadian Edition

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What Do Information Systems Have to Do with Business?

This edition of Rainer, Prince, Sánchez-Rodríguez, Splettstoesser Hogeterp, and Ebrahimi's *Introduction to Information Systems* will answer this question for you. In every chapter, you will see how real global businesses use technology and information systems to increase their profitability, gain market share, improve their customer service, and manage their daily operations. In other words, you will learn how information systems provide the foundation for modern business enterprises.

Our goal is to teach all business majors, especially undergraduates, how to use IT to master their current or future jobs and to help ensure the success of their organization. Our focus is not on merely *learning* the concepts of information technology but rather on *applying* those concepts to perform business processes more efficiently and effectively. We concentrate on placing information systems in the context of business, so that you will more readily grasp the concepts presented in the text.

What's In IT For Me?

The theme of this book, *What's In IT For Me?*, is a question asked by most students who take this course. Our book will show you that IT is the backbone of any business, whether you're majoring in Accounting, Finance, Marketing, Production/Operations Management, Human Resource Management, or MIS.

New to This Edition

The fifth edition contains many exciting additions and changes. These elements make the text more interesting and readable for students of all majors, while still providing the most current information possible in the rapidly changing field of information systems.

- A new section on Personal Information Asset Protection added to Chapter 4 (Information Security and Controls).
- Expanded coverage on Big Data in Chapter 5 (Data and Knowledge Management).
- A new section on The Internet of Things in Chapter 8 (Wireless, Mobile Computing, and Mobile Commerce).
- Expanded coverage on business analytics in Chapter 12 by discussing descriptive, predictive, and prescriptive analytics.
- All new or updated chapter-opening and closing cases.
- All new or updated *IT's About Business* boxes in every chapter.

Key Features

We have been guided by the following goals that we believe will enhance the teaching and learning experience.

"What's In IT For Me?" Theme

We show why IT is important by calling attention in each chapter to how that chapter's IT topic relates to students in each major.

- A feature of this edition is chapter-opening "teasers" that list examples of specific tasks for each major that the chapter will help prepare students to do.
- Every chapter concludes with a summary of how the concepts relate to each functional area ("What's In IT For Me?").

Active Learning

We recognize the need to actively involve students in problem solving, creative thinking, and capitalizing on opportunities. Therefore, we have included a variety of hands-on exercises and activities, including exercises that require students to use software application tools. Other active learning opportunities included in the Wiley online courseware include ethics cases and spreadsheet activities.

In addition, the Wiley online courseware includes career readiness materials that will be invaluable for students as they prepare for jobs in the real world.

Through these activities available in the text and online, we enable students to apply the concepts they learn.

Diversified and Unique Examples from Different Industries

Extensive use of vivid examples from large corporations, small businesses, and government and not-for-profit organizations helps to enliven concepts by demonstrating the capabilities of IT, its cost and justification, and innovative ways in which real corporations are using IT in their operations. Each chapter constantly highlights the integral connection between IT and business. This is especially evident in the "IT's About Business" boxes.

Misuse of IS

Like other textbooks, this text presents many examples of IS success. But we also provide numerous examples of IS failures, in the context of lessons that can be learned from such failures. Misuse of IS can be very expensive, as we illustrate.

Innovation and Creativity

In today's rapidly changing environment, creativity and innovation are essential for a business to operate effectively and profitably. Throughout the text we demonstrate how IT facilitates these concepts.

Global Focus

Because an understanding of global competition, partnerships, and trading is essential to success in business, we provide a broad selection of international cases and examples. We discuss how IT facilitates export and import, the management of multinational companies, and electronic trading around the globe.

Focus on Ethics

With corporate scandals appearing daily in the news, ethics and ethical questions have come to the forefront of business people's minds. In addition to a chapter that concentrates on ethics and privacy (Chapter 3), we have included examples and cases that focus on business ethics throughout the chapters.

Pedagogical Structure

Other pedagogical features provide a structured learning system that reinforces the concepts through features such as chapter-opening organizers, section reviews, frequent applications, and hands-on exercises and activities.

Chapter-Opening Organizers include the following pedagogical features:

- The *Learning Objectives* provide an overview of the key concepts students should come away with after reading the chapter.
- The *Chapter Outline* lists the major chapter topics.
- An opening *Case* identifies a business problem faced by an actual company, describes the IT solution applied to the business problem, presents the results of the IT solution, and summarizes what students can learn from the case.
- New "*What's In IT For Me*?" "teasers" give students a quick hint about skills in their majors for which each chapter will help them prepare.

Study Aids are provided throughout each chapter. These include the following:

- *IT's About Business* cases provide real-world applications, with questions that relate to concepts covered in the text. Icons relate these sections to the specific functional areas.
- *Tables* list key points or summarize different concepts.
- End-of-section reviews (*Before You Go On . . .*) prompt students to pause and test their understanding of basic concepts before moving on to the next section.

End-of-Chapter Study Aids provide extensive opportunity for the reader to review and "do something" with the concepts they have just studied:

- *What's In IT For Me?* is a unique chapter summary section that demonstrates the relevance of topics for different functional areas (Accounting, Finance, Marketing, Production/Operations Management, Human Resource Management, and MIS).
- The *Summary*, keyed to learning objectives listed at the beginning of the chapter, enables students to review the major concepts covered in the chapter.
- The *Chapter Glossary* facilitates studying by listing and defining all of the key terms introduced in the chapter.
- *Discussion Questions* and *Problem-Solving Activities* provide practice through active learning. These exercises are hands-on opportunities to use the concepts discussed in the chapter.
- A *Case* presents a brief case study organized around a business problem and explains how IT helped to solve it. Questions at the end of the case relate it to concepts discussed in the chapter.
- Technology guides at the end of the textbook provide more details on the hardware, software, and other technology underlying the key information systems discussed throughout the text. In this way, the chapters can focus on how technology is used in organizations, while the technology guides allow students to "look under the hood" to see how things work.

Online Resources

This text also facilitates the teaching of an introductory IS course by providing support materials for instructors and students.

Instructor's Manual

The *Instructor's Manual* includes a chapter overview, teaching tips and strategies, answers to all end-of-chapter questions, supplemental mini-cases with essay questions and answers, and experiential exercises that relate to particular topics.

Test Bank

The *Test Bank* is a comprehensive resource for test questions. It contains multiple-choice, true/false, short answer, and essay questions for each chapter. The multiple-choice and true/false questions are labelled according to difficulty: easy, medium, or hard.

The test bank is available for use in TestGen's easy-to-use software. TestGen is a powerful tool for creating and managing exams that can be printed to paper or published directly to

Canvas, Blackboard, and other eLearning systems. For more information please visit your Wiley online courseware.

PowerPoint Presentations

The *PowerPoint Presentations* consist of a series of slides for each chapter of the text that are designed around the text content, incorporating key points from the text and all text illustrations as appropriate. The PowerPoint presentations include media-rich PowerPoint slides with links to websites and videos. Students also have lecture slides for note-taking.

Weekly Updates

Weekly updates, harvested from around the Web by David Firth of the University of Montana, provide you with the latest IT news and issues. These are posted every Monday morning throughout the year at *wileyisupdates.com* and include links to articles and videos as well as discussion questions to assign or use in class.

Image Library

All textbook figures are available for download in the Wiley online courseware. These figures can easily be added to PowerPoint presentations.

Wiley Online Courseware

Wiley's online courseware is a place where students can learn, collaborate, and grow. Through a personalized experience, students create their own study guide while they interact with course content and work on learning activities.

The course gives you tools to quickly organize learning activities, manage student collaboration, and customize your course so that you have full control over content as well as the amount of interactivity between students.

Wiley E-Textbook

E-textbooks are complete digital versions of the text that help students study more efficiently as they:

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- Collaborate with our team to ensure your satisfaction

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Introduction to Information Systems

CHAPTER OUTLINE	LEARNING OBJECTIVES
1.1 Why Should I Study Information Systems?	**1.1** Identify the reasons why being an informed user of information systems is important in today's world.
1.2 Overview of Computer-Based Information Systems	**1.2** Describe the various types of computer-based information systems in an organization.
1.3 How Does IT Impact Organizations?	**1.3** Discuss ways in which information technology can affect managers and nonmanagerial workers.
1.4 Importance of Information Systems to Society	**1.4** Identify positive and negative societal effects of the increased use of information technology.

Opening Case

Case 1.1 The Digital Transformation of the Canadian Imperial Bank of Commerce (CIBC)

The Background and the Problem

Canadian Imperial Bank of Commerce (CIBC) is the fifth largest bank by total assets in Canada. CIBC (**www.cibc.com**) was formed on June 1, 1961 as a result of the merger of two chartered Canadian banks: Canadian Bank of Commerce (est. 1867) and the Imperial Bank of Canada (est. 1875). Despite being an old institution, CIBC has a history of embracing technology. For instance, it was the first Canadian bank to introduce a 24-hour cash dispenser in 1969 and the first to offer automated telephone banking in 1992. In addition, CIBC was the first among the five large Canadian banks to introduce an app for mobile banking and to offer eDeposit.

In early 2010, CIBC realized that to be successful in the financial services industry, it needs to up its digital innovation even further. The industry was, and still is, facing numerous threats from startups and established players like Apple and Google that are luring away customers from traditional banks by providing more convenient payment and banking options. Such options are especially appealing to millennials, 71 percent of whom would rather go to the dentist than to hear from their bank and 33 percent believe that in five years they will not need a bank. In fact, 73 percent of millennials are more excited about a financial product from companies like Google Inc. and PayPal Holdings Inc. and a third are open to switching banks in the next 90 days.

Digital Solutions

To address the concerns and to enable nimble responses to the technologically evolving environment, CIBC decided to undergo a digital transformation. So, unlike the common practice in many banks, CIBC did not want to run the digital channel as only one service channel alongside branches, ATMs, and telephone banking. However, maintaining a high level of digital engagement requires continuous innovation. Although such innovation was not new to CIBC, the bank knew that it needed a dedicated effort to succeed in the digital channel.

One project that had a particularly positive impact on CIBC's endeavour to attain digital transformation was *Live Labs*. Located in Toronto's MaRS Discovery District, CIBC Live Labs, an innovation and digital technology centre, strives to build, test, and launch digital

solutions to enhance customers' experience. Some of their most successful solutions released to date are:

- Apple watch banking app: CIBC was the first Canadian bank to launch a mobile banking Apple Watch™ App that enables customers to check their balance and transactions, transfer funds between accounts, locate a CIBC branch or ATM, etc.
- CIBC Hello Home: This is a new iOS app that makes mortgage applications easier and more convenient. The app allows users to apply, negotiate, track, and receive approval of their mortgage from their iPhone.
- Natural language voice search for mobile banking: This is an in-app voice command that allows users of the CIBC mobile banking app to access various features and to explore products with a simple voice prompt. For instance, if a user says "send money," a list of options, such as e-transfers, is presented.

Results

CIBC's efforts did not go unnoticed. In 2016, CIBC earned the highest overall score in the Forrester Research Canadian mobile functionality benchmark. According to the Forrester Research report, CIBC stands out by supporting diverse mobile touch-points and excelling at marketing and sales with features such as pre-approved offers and pre-filled applications in the mobile app. Subsequently, in March 2017, CIBC was recognized as the leader in mobile banking services and experience in Canada by Surviscor. Surviscor is a North American firm specializing in the analysis and ranking of Canadian digital customer experiences provided by service firms.

CIBC also won the prestigious award of IT World Canada Digital Transformation in 2017 mainly as a result of its launch of CIBC Live Labs.

In terms of return on investment (ROI), before embarking on its digital transformation, CIBC's sales from its digital channels made up 2 percent or less of its revenue. This number increased to 12 percent in three years after the bank engaged in digital transformation. The bank also saw a growth in digital transactions to 85 percent of day-to-day banking. In addition, CIBC's sales of digital products and services increased from 250,000 units in 2014 to 1.1 million units in 2017.

Sources: Compiled from "Inside CIBC's Award-Winning Digital Transformation Strategy," CIBC Online Banking, April 17, 2019; The Economist Intelligence Unit, "2019: The Year of Digital Decisions," *The Economist*, 2019; "CIBC Innovation Banking Launches to Serve North American Companies," PRNewswire, January 8, 2018; E. Wood, "CIBC Targets Tech-Savvy Businesses with New Innovation Banking Arm," ITBusiness.ca, January 8, 2018; "Retail Banking Vulnerability Study," cg42, 2018; J. Horn, "CIBC, Then and Now," *Strategy*, September 22, 2017; D. Bradbury, "CIBC Takes Digital Transformation to the Bank," *IT World Canada*, June 14, 2017; "Excellence in Digital Transformation Recognized," ITBusiness.ca, June 14, 2017; E. Wood, "Live Labs Illustrates CIBC's Commitment to Digital Transformation," ITBusiness.ca, May 11, 2017; J. Marous, "Is This the Most Innovative Digital Bank in North America?" *The Financial Brand*, April 7, 2017; "How CIBC Is Winning the Mobile Banking Competition," *Future Digital Finance*, 2017; J. Castaldo, "CIBC CEO Victor Dodig on Banking's Tech Revolution," *Canadian Business*, January 14, 2016; "There's No Slowing Down Millennials-Capitalizing on a Growing and Influential Generation," *First Data*, 2016; C. Pellegrini, "How One of Canada's Oldest Banks Is Acting Like a Young Tech Company: 'We're Becoming Cooler,'" *Financial Post*, August 21, 2015.

Questions

1. Explain why embracing a digital transformation strategy was necessary for CIBC.
2. Can you think of other digital initiatives CIBC might use to increase customer satisfaction and enhance its bottom line?

Introduction

Before we proceed, we need to define information technology and information systems. **Information technology (IT)** refers to any computer-based tool that people use to work with information and to support an organization's information and information-processing needs. An **information system (IS)** collects, processes, stores, analyzes, and disseminates information for a specific purpose.

IT has far-reaching effects on individuals, organizations, and our planet. Although this text is largely devoted to the many ways in which IT is transforming modern organizations, you will also learn about the significant impacts of IT on individuals and societies, the global economy, and our physical environment. In addition, IT is making our world smaller, enabling more and more people to communicate, collaborate, and compete, thereby levelling the competitive playing field.

This text focuses on the successful applications of IT in organizations; that is, how organizations can use IT to solve business problems and achieve a competitive advantage in the marketplace. However, not all business problems can be solved with IT. Therefore, you must continue to develop your business skills!

When you graduate, either you will start your own business or you will work for an organization, whether it is public sector, private sector, for-profit, or not-for-profit. Your organization will have to survive and compete in an environment that has been radically transformed by information technology. This environment is global, massively interconnected, intensely competitive, 24/7/365, real-time, rapidly changing, and information-intensive. To compete successfully, your organization must use IT effectively.

As you read this chapter and this text, keep in mind that the information technologies you will learn about are important to businesses of all sizes. No matter which area of business you major in, which industry you work for, or the size of your company, you will benefit from learning about IT. Who knows? Maybe you will use the tools you learn about in this class to make your great idea a reality by becoming an entrepreneur and starting your own business!

The modern environment is intensely competitive not only for your organization, but for you as well. You must compete with human talent from around the world. Therefore, you personally will have to make effective use of IT.

Accordingly, this chapter begins with a discussion of three reasons why you should become knowledgeable about IT. Next, it distinguishes among data, information, and knowledge, and it differentiates computer-based information systems from application programs. Finally, it considers the impacts of information systems on organizations and on society in general.

1.1 Why Should I Study Information Systems?

Your use of IT makes you part of the most connected generation in history: You have grown up online; you are, quite literally, never out of touch; you use more information technologies (in the form of digital devices), for more tasks, and are bombarded with more information, than any generation in history. The *MIT Technology Review* refers to you as *Homo conexus*. Information technologies are so deeply embedded in your lives that your daily routines would be almost unrecognizable to a student just 20 years ago.

Essentially, you practise *continuous computing*, surrounded by a movable information network. This network is created by constant co-operation among the digital devices you carry (for example, laptops, tablets, and smartphones); the wired and wireless networks that you access as you move about; and Web-based tools for finding information and communicating and collaborating with other people. Your network enables you to pull information about virtually anything from anywhere, at any time, and to push your own ideas back to the Web, from wherever you are, via a mobile device. Think of everything you do online, often with your smartphone: register for classes; take classes (and not just at your university); access class syllabi, information, PowerPoints, and lectures; research class papers and presentations; conduct banking; pay your bills; research, shop, and purchase products from companies and other people; sell your "stuff"; search for, and apply for, jobs; make your travel reservations (hotel, airline, rental car); create your own blog and post your own podcasts and videos to it; design your own page on Facebook and LinkedIn; make and upload videos to YouTube; take, edit, and print your own digital photographs; stream music and movies to your personal libraries; use RSS feeds to create your personal electronic newspaper; text and tweet your friends and family throughout your day; send Snaps; order a ride from Uber; select a place or room to rent on Airbnb; and many other activities. (*Note:* If any of these terms are unfamiliar to you, don't worry. You will learn about everything mentioned here in detail later in this text.)

Let's put the preceding paragraph in perspective. What would a typical day for you be like if you had no access to computing devices of any kind, including your phone?

The Informed User—You!

So, the question is: Why you should learn about information systems and information technology? After all, you can comfortably use a computer (or other electronic devices) to perform many activities, you have been surfing the Web for years, and you feel confident that you can manage any IT application that your organization's Management Information Systems (MIS) department installs. Let's look at three reasons why you should learn about ISs and IT.

The first reason to learn about information systems and information technology is to become an **informed user**; that is, a person knowledgeable about ISs and IT. In general, informed users obtain greater value from whichever technologies they use. You will enjoy many benefits from being an informed user of IT, including:

- You will benefit more from your organization's IT applications because you will understand what is "behind" those applications (see **Figure 1.1**). That is, what you see on your computer screen is brought to you by your MIS department, who are operating "behind" your screen.
- You will be in a position to enhance the quality of your organization's IT applications with your input.
- Even as a new graduate, you will quickly be in a position to recommend—and perhaps to help select—which IT applications your organization will use.
- Being an informed user will keep you abreast of both new information technologies and rapid developments in existing technologies. Remaining "on top of things" will help you to anticipate the impacts that "new and improved" technologies will have on your organization and to make recommendations regarding the adoption and use of these technologies.
- You will understand how using IT can improve your organization's performance and teamwork as well as your own productivity.
- If you have ideas of becoming an entrepreneur, then being an informed user will help you to utilize IT when you start your own business.

The second reason to learn about ISs and IT is that the organization you join will undoubtedly be undergoing a digital transformation. In fact, digital transformation has become one of the most important strategies for organizations. The Data Warehousing Institute (**www.tdwi.org**) predicted that by the end of 2017, approximately two-thirds of CEOs of the *Forbes* Global 2000 companies would have digital transformation at the centre of their corporate strategy. (The Global 2000 is a list of the 2,000 largest public companies in the world, ranked by *Forbes* magazine.)

FIGURE 1.1 **MIS provides what users see and use on their computers.**

Digital transformation is the business strategy that leverages IT to dramatically improve employee, customer, and business partner relationships; to support continuous improvement in business operations and business processes; and to develop new business models and businesses. The information technologies that drive digital transformation include:

- Big Data (see Chapter 5)
- Business analytics (see Chapter 12)
- Social computing (see Chapter 9)
- Mobile computing (see Chapter 8)
- The Internet of Things (see Chapter 8)
- Agile systems development methods (see Chapter 13)
- Cloud computing (see Technology Guide 3)
- Artificial intelligence (see Technology Guide 4)

You see examples of digital transformation in this chapter's opening case and IT's About Business 1.1.

IT's About Business 1.1

A Variety of Digital Transformations

Wendy's

Fast food restaurant chain Wendy's (**www.wendys.com**) is undergoing a digital transformation with the goal of putting digital technologies at the centre of its customer experience. The company initiated its digital transformation process when it realized that many of its customers, both millennials and non-millennials, expect to interact with companies via digital channels. Therefore, Wendy's was going to be judged on the digital experience that it provided for these customers. To implement this transformation, Wendy's created a laboratory called 90 Degree Labs, which it staffed with engineers, customer experience experts, and user experience experts. The lab produces three products: the company website, apps, and self-order kiosks.

Wendy's became one of the first companies to use self-ordering kiosks to control labour costs, deploying this technology in about 300 of its restaurants by August 2018. Today, stores with the kiosks are seeing higher average sales and higher customer satisfaction scores. As such, the kiosks remain integral to Wendy's strategy to provide a superior digital customer experience.

Wendy's noted that its customers are already familiar with mobile apps and that its kiosks were an intermediate step in providing a mobile digital experience for them. The company believes that once its customers become comfortable using the in-store kiosks, they can transition more easily to ordering via a mobile app.

Utilizing kiosks and mobile apps will enable Wendy's to manage lines, plan kitchen capacity, and order the correct amount of supplies at the right times. Mobile apps also enable customers to get customized orders at the right place and time.

Professional Golf

Golf is having difficulties as the baby-boomer generation ages and millennials do not seem to be as interested in the game. In order to try to prevent closures, an initiative called "connected course" has been started. Connected course is a way for golf to broaden its appeal to younger people who are rarely without their computing devices.

First, golf courses must be prepared for the daily technology demands of a modern golf tournament. Each course must support the demands of television broadcasters, the tour's own scoring and operational systems, as well as wireless connectivity for spectators.

Preparing courses typically requires laying 10 to 15 kilometres of fibre in the ground as well as deploying sensors with 5G wireless technology. The goal of this technology is for it to generate better insights for staff, players, coaches, business partners, advertisers, and spectators.

The sensors will provide location data that will bring new insights into how spectators move around a course. These data provide tournament sponsors with relevant information on spectator location and movement to increase their potential engagement. For example, spectators could access information relating to a sponsor-operated event or sales concession.

The Freight Forwarding Industry

Freight forwarders assist their clients in shipping goods and raw materials by rail, ship, or plane. Significantly, this industry has conducted business the same way for many years. Freight forwarders employ a global network of agents who possess a thorough knowledge of duties, taxes, penalties, and port requirements around the world. In return for a fee from their clients, they negotiate rates with trucking companies, airlines, and ship owners, and they make deals based on large volumes of cargo.

This global business has lagged behind many other industries in adapting to digital transformation. Startup Freightos (**www.freightos.com**), an online marketplace, is addressing that problem. Freightos allows shippers to book online, receiving bids from multiple freight forwarders within seconds rather than days, and often for lower prices than offline alternatives offer.

Another startup, Windward (**www.windward.eu**), combines location data with other information about each vessel's size, owner, and other factors to map the paths and behaviours of ships

at sea. More than 90 percent of world trade moves by sea. Once cargo is on a ship, however, little information is available regarding the path the ship is taking or the stops it makes. Only in recent years have the largest ships regularly transmitted location data. However, even these ships may stop transmitting and "go dark" at any time.

To analyze the myriad data points coming in from each ship, Windward has constructed artificial intelligence systems using natural language processing to identify unusual or important patterns of behaviour. These systems generate maps that might reveal ships meeting mid-ocean to transfer cargo or crossing in and out of a country's territorial waters in patterns that can be associated with illegal fishing or smuggling. Most of Windward's customers are fishing authorities, coast guards, and navies. However, the company is confident that its information can be valuable to ship owners, cargo owners, and insurance companies as well.

Significantly, Amazon (**www.amazon.com**) is entering the freight forwarding business. For a detailed look at Amazon's efforts in this area, see the closing case in Chapter 11.

Canada's Olympic and Paralympic Teams

To win more games, Canada's Olympic and Paralympic teams are drawing on valuable insights and information obtained from data analysis. Own the Podium, a not-for-profit organization, was founded in 2004 to support national sport organizations in an effort to deliver more Olympic and Paralympic medals for Canada. Recently, Own the Podium partnered with Canadian Tire, a leading supporter of sports in Canada, and is using its best-in-class data analytics division and decades-long history in predictive modelling.

There are two distinct phases in, and goals for, the analysis and modelling: talent identification and finding a performance edge for them.

Canadian Tire's data analysts use various data from international sports competitions from several decades ago to the present date to build predictive models and to provide insights as to which athletes should be supported. Specifically, based on the available global data and athletes' current performance, data analysts determine who is most likely to achieve medals in future events, and therefore, should receive developmental resources and funding.

Data analysis also provides teams and coaches with insights into what matters in a quicker manner so they can incorporate them into the daily training and athlete preparation programs. For instance, in short-track speed skating, the analysis focuses on where the individuals must be on the second or third last lap. An athlete only has a chance to win if they are the first or they are in a position to be in first place. In other words, if a skater is in second or third in the last laps, they are unlikely to win.

As another example, consider swimming, where the sports analysts map the performance of top international swimmers from around the world using data that go back a few decades. From this analysis, the curve of race times in the future international competitions required for a Canadian swimmer to be on the right path for an Olympic medal in the Summer Olympics in Tokyo is determined.

Sources: Compiled from "Can Digitisation Help Golf out of Bunker?" *Computer Weekly*, August 7–13, 2018; B. Sozzi, "Wendy's CEO: Future of Fast Food Will Include Kiosks and Fast Pass Drive-Thrus," *The Street*, June 11, 2018; D. Barnes, "How Canada's Olympians Are Using Data Analysis to Build a Platform to the Podium," *National Post*, December 6, 2017; A. Bruno, "Technology and Its Impact on the Freight Forwarding Industry," *ICAT Logistics*, June 12, 2017; A. Glaser, "The U.S. Will Be Hit Worse by Job Automation than Other Major Economies," *Recode*, March 25, 2017; "One Fast Food Chain Is Adding Automated Kiosks to 1,000 of Its Restaurants in 2017," *Futurism*, March 3, 2017; L. Dignan, "Wendy's Cooks Up Digital Transformation Plans with Kiosks, Mobile Apps, Customer Experience Lab," *TechRepublic*, March 1, 2017; "Digital Transformation in the U.S.," *IDC InfoBrief*, January 2017; C. McDonald, "Unilever Puts Digital Transformation in the Hands of IT," *Computer Weekly*, November 2, 2016; N. Byrnes, "This $1 Trillion Industry Is Finally Going Digital," *MIT Technology Review*, October 24, 2016; D. Kline, "Are Robots Taking Over Fast Food Restaurants?" *Newsweek*, September 5, 2016; D. Newman, "Top 10 Trends for Digital Transformation in 2017," *Forbes*, August 30, 2016; M. Castillo, "Technology Could Soon Be Replacing Fast Food Workers," PSFK.com, April 21, 2016; "Wendy's Opens 90 Degree Labs to Fuel Future Technology Innovation," PRNewswire, May 26, 2015; "Canadian Tire Data Analysts to Help Put Athletes on the Podium," Canadian Sport Institute Ontario, April 27, 2015.

Questions

This case presents digital transformations in four organizations across four industries.

1. For which organization is digital transformation the most critical? Why? Support your answer.
2. For which organization is digital transformation the least critical? Why? Support your answer.
3. Would your university be a good candidate for digital transformation? Why or why not? Support your answer.
4. If you responded yes, then what types of digital initiatives should your university undertake to transform itself?

The third reason to learn about ISs and IT is that managing the IS function within an organization is no longer the exclusive responsibility of the IS department. Rather, users now play key roles in every step of this process. The overall objective in this text is to provide you with the necessary information to contribute immediately to managing the IS function in your organization. In short, our goal is to help you become a very informed user!

IT Offers Career Opportunities

Because IT is vital to the operation of modern businesses, it offers many employment opportunities. The demand for traditional IT staff—programmers, business analysts, systems analysts, and designers—is substantial. In addition, many well-paid jobs exist in areas such as the Internet and electronic commerce (e-commerce), mobile commerce (m-commerce), network security, telecommunications, and multimedia design.

The IS field includes the people in various organizations who design and build information systems, the people who use those systems, and the people responsible for managing those systems. At the top of the list is the chief information officer (CIO).

The CIO is the executive who is in charge of the IS function. In most modern organizations, the CIO works with the chief executive officer (CEO), the chief financial officer (CFO), and other senior executives. Therefore, they actively participate in the organization's strategic planning process. In today's digital environment, the IS function has become increasingly strategic within organizations. As a result, although most CIOs still rise from the IS department, a growing number are coming up through the ranks in the business units (e.g., marketing, finance). Regardless of your major, you could become the CIO of your organization one day. This is another reason to be an informed user of information systems!

Table 1.1 provides a list of IT jobs along with a description of each one. For further details about careers in IT, see **https://ca.linkedin.com**, **www.computerworld.com/category/careers/**, and **www.monster.ca**.

TABLE 1.1 Information Technology Jobs

Position	Job Description
Chief Information Officer	Highest-ranking IS manager; responsible for all strategic planning in the organization
IS Director	Manages all systems throughout the organization and the day-to-day operations of the entire IS organization
Information Centre Manager	Manages IS services such as help desks, hot lines, training, and consulting
Applications Development Manager	Coordinates and manages new systems development projects
Project Manager	Manages a particular new systems development project
Systems Analyst	Interfaces between users and programmers; determines information requirements and technical specifications for new applications
Operations Manager	Supervises the day-to-day operations of the data and/or computer centre
Programming Manager	Coordinates all applications programming efforts
Social Media Manager	Coordinates all social media development efforts and all social media monitoring and response efforts
Business Analyst	Focuses on designing solutions for business problems; interfaces closely with users to demonstrate how IT can be used innovatively
Systems Programmer	Creates the computer code for developing new systems software or maintaining existing systems software
Applications Programmer	Creates the computer code for developing new applications or maintaining existing applications
Emerging Technologies Manager	Forecasts technology trends; evaluates and experiments with new technologies
Network Manager	Coordinates and manages the organization's voice and data networks
Database Administrator	Manages the organization's databases and oversees the use of database-management software
Auditing or Computer Security Manager	Oversees the ethical and legal use of information systems
Webmaster	Manages the organization's website
Web Designer	Creates websites and pages

Career opportunities in IS are strong and are projected to remain strong over the next 10 years. In fact, *Canadian Business* listed its 100 "Best Jobs of 2019," MSN listed its "Highest Paying In-Demand Jobs in Canada for 2019," and *Forbes* listed its "20 Best Jobs" for 2018. Let's take a look at these rankings. (Note that the rankings differ because the media outlets used different criteria in their research.) As you can see, jobs suited for MIS majors appear in all three lists, many of them quite high. The media outlets with their job rankings are as follows:

Canadian Business (out of 100)
#26 Computer Systems Manager
#46 Software Engineer
#54 Database Analyst
#56 Computer Engineer
#65 Telecommunication Manager
#84 Information Systems Analyst
#94 Web Designers & Developers

MSN (out of 20)
#2 Software Engineer
#8 IT Project Manager

Forbes (out of 20)
#2 Software Engineer
#4 IT Solutions Architect
#11 IT Manager
#13 Data Engineer
#14 Frontend Engineer (User Experience Designer)

Not only do IS careers offer strong job growth, but the pay is excellent as well. Employment and Social Development Canada notes that a "computerized management information systems manager" in Canada has an hourly wage between $27.50 and $75.90, with a median of $49.45.

Managing Information Resources

Managing information systems in modern organizations is a difficult, complex task. Several factors contribute to this complexity. First, information systems have enormous strategic value to organizations. Firms rely on them so heavily that, in some cases, when these systems are not working (even for a short time), the firm cannot function. (This situation is called "being hostage to information systems.") Second, information systems are very expensive to acquire, operate, and maintain.

A third factor contributing to the difficulty in managing information systems is the evolution of the management information systems (MIS) function within the organization. When businesses first began to use computers in the early 1950s, the MIS department "owned" the only computing resource in the organization, the mainframe. At that time, end users did not interact directly with the mainframe.

In contrast, in the modern organization, computers are located in all departments, and almost all employees use computers in their work. This situation, known as *end-user computing*, has led to a partnership between the MIS department and the end users. The MIS department now acts as more of a consultant to end users, viewing them as customers. In fact, the main function of the MIS department is to use IT to solve end-users' business problems.

As a result of these developments, the responsibility for managing information resources is now divided between the MIS department and the end users. This arrangement raises several important questions: Which resources are managed by whom? What is the role of the MIS

department, its structure, and its place within the organization? What is the appropriate relationship between the MIS department and the end users? Regardless of who is doing what, it is essential that the MIS department and the end users work in close co-operation.

There is no standard way to divide responsibility for developing and maintaining information resources between the MIS department and the end users. Instead, that division depends on several factors: the size and nature of the organization, the amount and type of IT resources, the organization's attitudes toward computing, the attitudes of top management toward computing, the maturity level of the technology, the amount and nature of outsourced IT work, and even the countries in which the company operates. Generally speaking, the MIS department is responsible for corporate-level and shared resources, and the end users are responsible for departmental resources. **Table 1.2** identifies both the traditional functions and various new, consultative functions of the MIS department.

TABLE 1.2 The Changing Role of the Information Systems Department

Traditional Functions of the MIS Department

- Managing systems development and systems project management
  - As an end user, you will have critical input into the systems development process. You will learn about systems development in Chapter 13.
- Managing computer operations, including the computer centre
- Staffing, training, and developing IS skills
- Providing technical services
- Infrastructure planning, development, and control
  - As an end user, you will provide critical input about the IS infrastructure needs of your department.

New (Consultative) Functions of the MIS Department

- Initiating and designing specific strategic information systems
  - As an end user, your information needs will often mandate the development of new strategic information systems.
- You will decide which strategic systems you need (because you know your business needs and requirements better than the MIS department does), and you will provide input into developing these systems.
- Incorporating the Internet and electronic commerce into the business
  - As an end user, you will be primarily responsible for effectively using the Internet and electronic commerce in your business. You will work with the MIS department to accomplish these tasks.
- Managing system integration, including the Internet, intranets, and extranets
  - As an end user, your business needs will determine how you want to use the Internet, your corporate intranets, and extranets to accomplish your goals. You will be primarily responsible for advising the MIS department on the most effective use of the Internet, your corporate intranets, and extranets.
- Educating the non-MIS managers about IT
  - Your department will be primarily responsible for advising the MIS department on how best to educate and train your employees about IT.
- Educating the MIS staff about the business
  - Communications between the MIS department and business units is a two-way street. You will be responsible for educating the MIS staff on your business, its needs and requirements, and its goals.
- Partnering with business unit executives
  - Essentially, you will be in a partnership with the MIS department. You will be responsible for seeing that this partnership is one "between equals" and ensuring its success.
- Managing outsourcing
  - Outsourcing is driven by business needs. Therefore, the outsourcing decision resides largely with the business units (i.e., with you). The MIS department, working closely with you, will advise you on technical issues such as communications bandwidth and security.
- Proactively using business and technical knowledge to see innovative ideas about using IT
  - Your business needs will often drive innovative ideas about how to effectively use information systems to accomplish your goals. The best way to bring these innovative uses of IS to life is to partner closely with your MIS department. Such close partnerships have amazing synergies!
- Creating business alliances with business partners
  - The needs of your business unit will drive these alliances, typically along your supply chain. Again, your MIS department will act as your advisor on various issues, including hardware and software compatibility, implementing extranets, communications, and security.