

Chapter 2

Global E-Business and Collaboration

Student Learning Objectives

1. What major features of a business are important for understanding the role of information systems?
2. How do systems serve different management groups in a business?
3. How do systems that link the enterprise improve organizational performance?
4. Why are systems for collaboration and teamwork so important and what technologies do they use?
5. What is the role of the information systems function in a business?

Chapter Outline

2.1 Components of a Business

- Organizing a Business: Basic Business Functions
- Business Processes
- Managing a Business and Firm Hierarchies
- The Business Environment
- The Role of Information Systems in a Business

2.2 Types of Business Information Systems

- Systems for Management Decision Making and Business Intelligence
- Systems for Linking the Enterprise
- E-Business, E-Commerce, and E-Government

2.3 Systems for Collaboration and Teamwork

- What Is Collaboration?
- Business Benefits of Collaboration and Teamwork
- Building a Collaborative Culture
- Tools and Technologies for Collaboration and Teamwork

2.4 The Information Systems Function in Business

- The Information Systems Department
- Information Systems Services

Key Terms

The following alphabetical list identifies the key terms discussed in this chapter. The page number for each key term is provided.

Business, 39	Executive support systems (ESS), 50
Business intelligence, 46	Information systems department, 65
Business processes, 40	Information systems managers, 65
Chief information officer (CIO), 65	Interorganizational system, 54

Chief knowledge officer (CKO), 65	Knowledge management systems (KMS), 55
Chief privacy officer (CPO), 65	Knowledge workers, 43
Chief security officer (CSO), 65	Management information systems (MIS), 46
Collaboration, 56	Middle management, 43
Customer relationship management (CRM) systems, 54	Operational management, 43
Data workers, 43	Portal, 50
Decision-support systems (DSS), 49	Production or service worker, 43
Digital dashboard, 51	Programmers, 65
Electronic business (e-business), 55	Senior management, 42
Electronic commerce (e-commerce), 55	Supply chain management (SCM) systems, 54
E-government, 55	Systems analysts, 65
End users, 65	Teams, 56
Enterprise applications, 53	Telepresence, 60
Enterprise systems, 53	Transaction processing systems (TPS), 45

Teaching Suggestions

The opening vignette, “America's Cup 2010: USA Wins with Information Technology,” provides an outstanding example of how the BMW Oracle Racing organization used all the information technologies needed by a modern business firm to transform the sport of sailing. The team used a lightning-fast collection of massive amounts of data, powerful data management, rapid real-time data analysis, quick decision making, and immediate measurements of the results to improve the performance of not just the sailing vessel but also individual members of the racing team. Those technologies are the very same ones every business needs to succeed. Operational excellence gave the sailing team a distinct advantage over its competitors—something every business longs for. Most importantly, the Oracle team revised many of the processes and procedures used in sailing to take advantage of the technology, including retraining experienced sailors. That's no different than what is required of every organization that incorporates new technology into its existing structure. Oracle won the America's Cup because it had learned how to apply new technology to improve the processes of designing and sailing a competitive sailboat.

Section 2.1, “Components of a Business” Table 2.1 may help students understand that every business, large and small, uses the same basic business processes. Referring back to this table may help as you examine information needs for each functional area. You could have students select a business with which they are familiar and identify some of the business processes involved in each of the basic functional areas.

Another good classroom exercise is to use Figure 2.2 to compare how the order fulfillment process can be accomplished sequentially, as the figure shows, versus simultaneously as a new information system would allow.

The explanation of firm hierarchies sets the basis for the rest of the text as it explains the various levels of management. Senior management requires a different type of information than does middle management, operational management, knowledge workers, data workers, and production or service workers. Throughout the text, students will need this information to understand how and why each type of information system is necessary.

Section 2.2, “Types of Business Information Systems” This section focuses on how information systems serve various management levels in companies. The ultimate goal is for students to realize that one system helps serve other systems and, working together, all the systems serve the entire organization.

Type of System	Information Inputs	Information Outputs	Users
Transaction Processing Systems (TPS)	Transactions; daily events	Detailed reports; lists; summaries	Operations personnel; first-line supervisors
Management Information Systems (MIS)	Summary transaction data; high-volume data; simple models	Summary and exception reports	Middle managers
Decision Support Systems (DSS)	Optimized for data analysis, analytic models and data analysis tools	Interactive; simulations; analysis	Professionals, staff managers
Executive Support Systems (ESS)	Aggregate data; external, internal	Projections; responses to queries	Senior managers

It’s likely students’ main encounter will be with TPS systems when they first begin their careers. Stress the importance of accurate data at the TPS level since it serves as the initial source for the other systems.

Typically, DSS and ESS systems will be the least familiar. Students may better understand them if you ask these types of questions: Why do national retail chains open stores in certain locations and not others? How can a retail chain determine which type of clothing to stock at different geographic locations?

Most importantly, students need to understand that each type of information system supports the different kinds of decisions made at each managerial level.

Interactive Session: Technology: Can Airlines Solve Their Baggage Handling?

Case Study Questions

1. What types of transactions are handled by baggage handling systems?

The primary types of transactions handled by baggage handling systems are moving bags from check-in areas to departure gates, moving them from gate to gate and then finally,

moving them from arrival gates to baggage claim areas. That's a lot of input data, processing, and output data.

When computers scan the bar code on a piece of baggage, the data is processed quickly. The output determines where and when to send the bags. After being scanned once, the system always knows where the bags are at any point in the system.

2. What are the people, organization, and technology components of baggage handling systems?

People: Those who tag luggage at check-in counters must enter the data correctly. The tags contain flight information and a bar code that all of the computers in the system can read. Once bags reach the gate, they enter a sorting station where airline employees use computer terminals to send bags to the correct plane. Delta Airlines recently added a service that allows passengers to track their checked bags from scanning at check-in, to the flight they're loaded on, and then arrival at baggage claim.

Organization: Paying for often spotty and unreliable baggage handling service was one of the biggest sources of customer dissatisfaction throughout the industry. Baggage handling systems can be extremely expensive, but if implemented successfully, pay for themselves. Lost and mishandled baggage is a major expense for airlines, and reducing the incidence of lost and mishandled baggage creates significant yearly savings.

Technology: Baggage handling systems are among the most complex systems because they involve a wide variety of sensors, actuators, mechanical devices, and computers. The systems use over 3 million lines of software program code. Advanced technology used in these systems include destination-coded vehicles (DCV), automatic bar code scanners, use of radio frequency identification (RFID) tags, and high-tech conveyors equipped with sorting machines. Because DCVs move at high speed and do not come to a full stop to receive baggage, the conveyors must be extremely precise, depositing bags where they are needed at just the right time for maximum efficiency.

3. What is the problem these baggage handling systems are trying to solve? Discuss the business impact of this problem. Are today's baggage handling systems a solution to this problem? Explain.

The problem baggage handling systems are trying to solve is customer dissatisfaction and to promote customer goodwill as well as reduce costs.

Business impact: Overall the airline industry rate for lost luggage has improved by 38 percent over similar figures from two years ago when nearly 2.5 million bags were lost or delayed. Lost and mishandled baggage is a major expense for airlines. Reducing the problem creates significant yearly savings. The global airline industry price tag for mishandled baggage is \$2.5 billion per year.

Today's baggage handling systems do appear to be a solution to the problem. US Airways lost nine bags for every 1,000 travelers in 2007. After implementing a new system, that number dropped to three bags for every 1,000 travelers. Even though the company spent \$16 million on the system, the airline saved \$25 million a year and boosted customer satisfaction.

Between 2008 and 2010, Delta Airlines installed optical scanners to read baggage tag bar codes, widened and extended its system of baggage conveyor belts, and installed a central control room to monitor conveyor belts and baggage carousels in Atlanta and most of its other airport terminals. The airline recorded a top-notch baggage handling record of just 2.93 mishandled bags per 1,000 passengers. Bags now take less than 10 minutes to travel from terminal to terminal. The process used to take as long as 30 minutes with the older system.

4. What kinds of management reports can be generated from the data from these systems?

All data input into the baggage handling systems are recorded in transaction processing systems. From there, a variety of Management Information Systems (MIS), Decision Support Systems (DSS), and Executive Support Systems (ESS) reports can be generated.

MIS reports may include information about the number of bags at any given time in any given place; how long it takes to move a bag from point A to any other point in the system; the number of bags processed through the baggage handling system that are outside the norms. Equipment management reports can be generated that provide information about the maintenance status of the various system components.

DSS reports can be generated that advise managers when to perform maintenance on equipment or whether equipment should be moved to alternate locations based on baggage loads. These kinds of reports can also provide information to managers about whether the system is meeting its goals and how it can be improved.

ESS reports can advise executives about cost factors and if the system is providing the targeted return on investment. Information about the efficiency of the system is also available to executives based on data generated by the baggage handling systems.

MIS in Action

- 1. Do a search on “airline baggage handling technology” and identify suppliers of baggage handling systems to the airlines industry. Choose one supplier and describe how its systems work. How are they different from the systems described above?**

The Web site at www.airport-technology.com/contractors/baggage/ listed a couple dozen baggage handling technology companies.

ICM Airport Technics was chosen from the list. The Web site is www.airport-technology.com/contractors/baggage/icm/.

The site's introduction states, "ICM Airport Technics is a market leader in material flow and logistic systems in and around airports operating on an international scale. Our range of services start with manual or semi-automatic systems for smaller airports and forwarding agents and extends to turnkey, fully automatic systems for cargo and baggage handling and airline catering." ICM Airport Technics GmbH is a member of the Unitechnik Group.

The company introduces a new self-service bag drop system under press releases, at this Web link: www.airport-technology.com/contractors/baggage/icm/pressnever-queue-for-bag-drop-again.html.

Together with Qantas, ICM Airport Technics has developed a new self-service bag drop system. Eighty of these systems are already in operation at six Australian airports. For the first time in Europe, the system has been introduced at inter airport in Munich.

With the automatic self-service bag drop, the passenger can check-in their baggage without having to queue at a check-in desk.

This is how it works:

- A touch-screen monitor welcomes the traveler
- The system scans the boarding pass
- Boarding details are checked and validated
- The passenger places his bag on the weigh scale conveyor, using a tub if necessary
- The bag is weighed and dimensions are checked
- Excess payments are calculated
- If excess weight is detected, passenger can opt to pay excess or to repack the bag
- Heavy tag is printed, if required
- The bag is processed, the bag tag is activated, and the bag is sent to baggage handling system

In comparison to other bag drop systems, the Qantas ICM bag drop system uses a two-step method. Passengers check in via kiosk or online. This first step consists of time consuming processes (e.g., choice of seat, printing of boarding card and baggage tag). The second step—the baggage check-in time—is reduced by 15 to 45 seconds, depending on the passenger's experience. As these processes are separate, less bag drop systems are necessary and the existing check-ins are less frequently used.

The system operates with both paper and RFID boarding cards, together with barcode and RFID baggage tags. The advantages compared to conventional check-in desks include fewer check-in staff and passenger processing is much faster.

2. **Go to ibm.com/luggage and watch the video case study of the IBM baggage handling system installed at Schiphol Airport in Amsterdam. The video claims that Schiphol's system is the most advanced in the world. Review this case and discuss whether or not this claim is justified.**

The Schiphol Airport in Amsterdam processes an average of 140,000 airline passenger bags a day with a peak of 180,000 per day. It's to the airlines' advantage to sell short connection times, which increases demands on making baggage handling systems as efficient as possible. An airport needs a lot of space to sort bags but Schiphol Airport is limited in how much it can grow. Increasing capacity of the airport's baggage handling systems comes not by increasing space but by making the systems smarter. Intelligent software creates space where there was none before.

The airport processes 50 million bags a year with growth forecasted to 70 million a year, accounting for a 40 percent increase in capacity demand. The IBM system provides better control of baggage flows as baggage requirements grow. The system can track bags at any point in their journey through the airport's more than 21 kilometers (13.02 miles) of conveyor belts. The system also uses six robots and has a storage capacity for 9,000 bags. The IBM system has to synchronize all of that and work as one system.

3. One of the largest baggage system modernization program failures in history occurred at the Denver International Airport in the period 1995–2005. Do a search on “Denver baggage system failure” and write a brief report on why this project failed.

Information for the answer to this question came from <http://calleam.com/WTPF/wp-content/uploads/articles/DIABaggage.pdf> and is copied below.

Thanks mainly to problems with the baggage system, the airport's opening was delayed by a full 16 months. Expenditure to maintain the empty airport and interest charges on construction loans cost the city of Denver \$1.1M per day throughout the delay.

The embarrassing missteps along the way included an impromptu demonstration of the system to the media which illustrated how the system crushed bags, disgorged content and how two carts moving at high speed reacted when they crashed into each other. When opening day finally arrived, the system was just a shadow of the original plan. Rather than automating all 3 concourses into one integrated system, the system was used in a single concourse, by a single airline and only for outbound flights. All other baggage handling was performed using simple conveyor belts plus a manual tug and trolley system that was hurriedly built when it became clear that the automated system would never achieve its goals.

Although the remnants of the system soldiered on for 10 years, the system never worked well and in August 2005, United Airlines announced that they would abandon the system completely. The \$1 million per month maintenance costs exceeded the monthly cost of a manual tug and trolley system.

As with all failures the problems can be viewed from a number of levels. In its simplest form, the Denver International Airport (DIA) project failed because those making key decision underestimated the complexity involved. As planned, the system was the most complex baggage system ever attempted.

Ten times larger than any other automated system, the increased size resulted in an exponential growth in complexity. At the heart of the complexity lay an issue known as “line balancing.” To optimize system performance, empty carts had to be distributed around the airport ready to pick up new bags. With more than 100 pickup points (check in rows and arrival gates) each pickup needed to be fed with enough empty carts to meet its needs. The algorithms necessary to anticipate where empty carts should wait for new bags represented a nightmare in the mathematic modeling of queue behaviors. Failure to anticipate the number of carts correctly would result in delays in picking up bags that would undermine the system’s performance goals.

Failure to recognize the complexity and the risk involved contributed to the project being initiated too late. The process of requesting bids for the design and construction of the system was not initiated until summer of 1991. Based on the original project schedule, this left a little over two years for the contracts to be signed and for the system to be designed, built, tested and commissioned.

The closest analogous projects were the San Francisco system and one installed in Munich. Although much smaller and simpler, those systems took two years to implement. Given the quantum leap in terms of size and complexity, completing the Denver system in two years was an impossible task.

Interactive Session: Organizations: Piloting Valero with Real-Time Management

Case Study Questions

1. What people, organization, and technology issues had to be addressed when developing Valero’s dashboard?

People: Valero’s chief operating officer wanted a dashboard that would display real-time data related to plant and equipment reliability, inventory management, safety, and energy consumption. The dashboard system has the unintended consequence of helping managers learn more about how their company actually operates, and how to improve it.

Organization: The COO and his team review the performance of each refinery and determine how each plant is performing in comparison to the firm’s production plan. Any deviation from the plan requires an explanation from the plant manager and a description of corrective actions.

Technology: Valero’s dashboard uses a series of monitors in the headquarters operations center room with a huge central monitor screen showing a live display of the company’s Refining Dashboard. It allows the COO and other plant managers to review the performance of the firm’s 16 major refineries in the United States and Canada. The headquarters group can drill down from the executive level summary to the refinery level data and display the performance of individual system operations. The dashboard is also available on the Web for plant managers in remote locations to review. The data are refreshed every 5 minutes. The

dashboard taps into the firm's SAP Manufacturing Integration and intelligence application (transaction processing system) that is based on each plant's historical and current production data.

2. What measures of performance do the dashboards display? Give examples of several management decisions that would benefit from the information provided by Valero's dashboards.

The Refining Dashboard display real-time data on plant and equipment reliability, inventory management, safety, and energy consumption. Based on the success of the Refining Dashboard, the company plans to develop separate dashboards that show detailed statistics on power consumption for each unit and each plant. Managers will be able to share best practices and make changes in equipment to reduce energy consumption while maintaining production targets using the shared data.

Several management decisions that would benefit from the information in the dashboards include:

- Plant and equipment reliability: when to perform maintenance on machinery or replace equipment altogether
- Inventory management: determine optimal stock levels at each plant and move inventory from one plant to another if necessary
- Safety: is one plant suffering more safety violations than others or does one plant have an exceptional safety track record that others could emulate
- Energy consumption: What are the peak periods of energy consumption? What is causing the greatest amount of consumption? Would it be better to replace energy-hogging equipment or keep it?

3. What kinds of information systems are required by Valero to maintain and operate its refining dashboard?

Transaction processing systems like Valero's SAP Manufacturing Integration and Intelligence application, are necessary of course because they capture data at the production level and feed it to all other systems. The application helps gather, store, and process data for use in the dashboard. Management information systems and executive support systems are integral for processing, refining, and producing information that is ultimately included in Valero's dashboard. These systems provide the framework for operationalizing the company's strategic plan by focusing on measurable outcomes in four areas: financial, business process, customer, and learning and growth.

4. How effective are Valero's dashboards in helping management pilot the company? Explain your answer.

One of the most positive aspects of Valero's dashboard is the unintended consequence in which managers have been able to learn more about the company's operations and gain more insight about how to improve it. On the flip side, Valero's profits are not strongly related to small changes in its refining efficiency but rather are determined by the spread between the

price of refined products and the price of crude oil. The price of crude and aggregate petroleum demand are largely beyond the control of Valero's management. Although the dashboard focuses on one of the things management can control—refining costs—the dashboard does not display a number of strategic factors beyond its control. Dashboard system don't help management determine innovations in products, marketing, sales, or other areas of the firm where innovation is important. Dashboards only report on what has or is currently happening in the company.

5. Should Valero develop a dashboard to measure the many factors in its environment that it does not control? Why or why not?

Yes it should, to the extent it can measure external environmental factors that are meaningful to the company. One of the dangers of real time management is not measuring the right things. The goal would be to measure those factors that impact the firm's strategic goals via operational targets. The firm's executive support system could capture information and data from news services, financial market databases, economic information, and other external data senior executives require. The data and information can be refined to provide overall summaries that would be displayed on the dashboard with drill-down capabilities if executives so desire.

MIS In Action

Visit Valero.com and click on its Summary Annual Report. Based on this report, what other corporate dashboards might be appropriate for senior management?

(Valero.com, November 2010 [2009 Annual report].)

1. "Our products improve people's lives.
2. We are committed to our vision to be a world-class competitor in the global energy business, generating industry-leading returns on investments in an employee-focused, socially conscious, community-minded, safe, reliable, and environmentally responsible way.
3. We will strengthen our company to restore profitability."

In response to the strategic objective toward being employee-focused, executive management could develop a dashboard that monitors employee-related data by location and/or region like retention, days absent, pay levels, learning, promotion progression, and sales by employee. The dashboard would allow executives to identify trouble spots and determine if management action is warranted. Best practices among retail locations could be shared by managers and executives.

Regarding the strategic objective associated with generating industry-leading returns on investments, all financial information, including external environmental data could be monitored on a dashboard. Data like sales by individual retail location and by broader

regions could be monitored in real-time allowing executives to spot troubled areas quickly and take action if necessary. External factors related to competitors could be included, thereby putting the information into a broader context.

Measuring profitability factors can be accomplished by creating a dashboard that monitors all factors of Valero's financial data. Perhaps most importantly, the dashboard should include external environmental data and information about production rates of heavy sour crudes in foreign countries and the production amounts of heavier grades of crude oil in foreign markets. Supply and demand rates, both internal and external, should be included in the dashboard.

Enterprise applications: Central to this section is the need to coordinate activities, decisions, and knowledge across the firm's different levels, functions, and business units. Enterprise systems use a single central data repository in order to supply all users with a consolidated view of employees, customers, suppliers, and vendors. The key to effectively using enterprise systems is to eliminate redundancy and duplication, not just in the information systems but also in business processes.

Supply chain management systems: Students should understand the importance of a business managing its relationships with suppliers through a free-flowing exchange of information. The concept may seem foreign to those students who think a company is a closed entity and shouldn't share data or information with anyone outside the organization. A review of a typical supply chain may be helpful: sourcing, producing, and delivering goods and services. It may also be helpful to engage the students in an exercise that lists all the entities involved in producing and delivering goods and services.

Customer relationship management systems: Ask students how many times they've quit doing business with a company because of poor customer service. Ask them how many times they've had to supply a business with the same information simply because they talked to a different department in the company. Discuss how important it is for every functional area in a business to have the same consolidated view of its customers to avoid these kinds of problems.

Knowledge management systems: Few, if any, students have probably had any experience with these systems. Point out that businesses are beginning to realize how much expertise and experience is locked away in employees' heads and that it's imperative to find a way to capture that information. Moreover, it's important that businesses find a way to make the expertise and experience available to a wide range of users. On the other hand, students should understand that employees are very reluctant to impart with their individual knowledge due to fear or self-preservation.

Intranets and extranets: As Internet-based technologies continue to expand the basic platforms for disseminating information, smaller businesses that cannot afford to implement enterprise applications can turn to intranets and extranets. Your difficulty will be getting students to understand the difference between the two because they operate basically the same way. Intranets are limited to internal users; extranets are available to external users as

well as internal users. Both are an inexpensive way to quickly disseminate information and data across functional lines and organizational boundaries.

E-business, e-commerce, and e-government: Have students give examples of their own experiences with each of these. Students are most often confused between e-business and e-commerce. Stress that e-business refers to the use of digital technology and the Internet to execute major business processes while e-commerce is more narrowly centered on the buying and selling of goods and services over the Internet.

Section 2.3 “Systems for Collaboration and Teamwork” Students have probably used most of these systems without even realizing their business value. Your task is to relate these ever-increasing common technologies to business processes and needs. Discuss how they can use cell phones, instant messaging, social networking sites, and wikis in a business setting to communicate, collaborate, and share ideas with team members, business partners, customers, and suppliers.

One exercise you can use to reinforce the usefulness of team collaboration is to have small student groups explore social networking sites, or Twitter to see how many postings by businesses they can find. For instance, Twitter has tweets for Free Honey Bunches of Oats at Walmart and a tweet for an article about General Electric’s solar technology. Businesses also make use of the popular YouTube.com to post videos of their products. This exercise will help demonstrate how businesses must constantly adapt their marketing strategies to reach customers. You can also generate a discussion about students’ experience on these kinds of sites in relation to business uses and ask them to relate how effective these new methods of engaging customers are.

Table 2.2 (page 58) emphasizes the benefits of collaboration while Figure 2.10 (page 58) highlights the necessity of having the appropriate organization structure and culture, along with the right technology. Discuss how the absence of even one of these three can hinder or prevent collaboration. Ask students to draw on their own experiences to compare and contrast firms with a collaborative culture to those without.

Because most of the online collaborative tools are relatively unknown, you can have teams of students explore one or two of them and then present to the class a list of characteristics, capabilities, advantages and disadvantages, for each one. You can also have the student teams evaluate one or more collaborative programs according to the time/space matrix in Figure 2.11 (page 64). If most students have little or no work experience, evaluate the tools based on their use in your classroom.

Have students explore the use of business wikis first-hand by visiting SAP’s Enterprise Solution Wiki at <http://wiki.sdn.sap.com/wiki/display/ESpackages/ES+Wiki+Home>, or LotusNotes Wiki at <https://www.ibm.com/developerworks/lotus/>. Both wikis will help demonstrate the usefulness of having so much knowledge at your fingertips plus the ease with which companies are gathering, storing, and disseminating knowledge. The home page of IBM’s LotusNotes Wiki also has a great list of how to perform various wiki tasks. Students can see how easy it is to navigate wikis by reading these instructions.

Section 2.4. “The Information Systems Function in Business” If possible, arrange a session with the school’s information systems department to allow students to see first-hand how such a center works and who is responsible for running the systems. Have the IS staff and students participate in a Question and Answer forum about how typical processes are handled. Many students have a better appreciation of how these complex centers work when they actually see one in operation rather than just reading about it. Stress to students that in all but the smallest of firms these systems are critical to the operational efficiency and sheer survival in a very competitive marketplace.

Most importantly, students should understand that the IS staff is responsible for the well-being of all users in an organization. Users and the IS staff are teammates not polarizing opposites.

Review Questions

1. What major features of a business are important for understanding the role of information systems?

Define a business and describe the major business functions.

A business is a formal organization whose aim is to produce products or provide services for a profit. That is, to sell products at a price greater than the costs of production. Every business, large or small, has these four major functions: manufacturing and production; sales and marketing; human resources; and finance and accounting.

Define business processes and describe the role they play in organizations.

A business process is a logically related set of activities that define how specific business tasks are performed. Business processes are the ways in which organizations coordinate and organize work activities, information, and knowledge to produce their valuable products or services.

Business processes for the manufacturing and production area include product assembling, quality checking, and producing bills of materials. For the sales and marketing area, business processes include identifying customers, making customers aware of the product, and selling the product. For finance and accounting, business processes includes paying creditors, creating financial statements, and managing cash accounts. For human resources, business processes include hiring employees, evaluating employees’ job performance, and enrolling employees in benefits plans.

Identify and describe the different levels in a business firm and their information needs.

From highest to lowest, the three levels of the organizational hierarchy are senior, middle, and operational management.

- **Senior managers** need summary information that quickly informs them about the overall performance of the firm, such as gross sales revenues, sales by product group and region, and overall profitability.
- **Middle managers** need more specific information on the results of specific functional areas and departments of the firm, such as sales contacts by the sales force, production statistics for specific factories or product lines, employment levels and costs, and sales revenues for each month or even each day.
 - Knowledge workers, such as engineers, scientists, or architects, design products or services and create new knowledge for the firm. They may need access to external scientific databases or internal databases with organizational knowledge.
- **Operational managers** need transaction-level information, such as the number of parts in inventory each day or the number of hours logged on Tuesday by each employee.
 - Production or service workers actually produce the product and deliver the service. Production workers need access to information from production machines. Service workers need access to customer records so they can take orders and answer questions from customers.

Types of information systems include transaction processing at the operational level, decision-support systems and management information systems at the middle level, and executive support systems at the senior level.

Explain why environments are important for understanding a business.

Business environments are constantly changing. New developments in technology, politics, customer preferences, and regulations happen all the time. In general, when businesses fail, it is often because they failed to respond adequately to changes in their environments. A firm must monitor changes in its environment and share information with key entities in that environment in order to stay in business.

External business environmental forces include: technology and science; economy, international change, and politics.

Internal business environmental forces include: customers, suppliers, stockholders, regulations, and competitors.

2. How do systems serve the various levels of management in a business?

Define business intelligence systems.

Business intelligence systems focus on delivering information to support management decision making. These systems use data and software tools for organizing, analyzing, and providing access to data to help managers and other enterprise users make more informed decisions. Business intelligence addresses the decision-making needs of all levels of management.

Business intelligence systems for middle management help with monitoring, controlling, decision-making, and administrative activities in an organization.

Describe the characteristics of transaction processing systems (TPS) and the role they play in a business.

Transaction processing systems (TPS) are computerized systems that perform and record daily routine transactions necessary in conducting business; they serve the organization's operational level. The principal purpose of systems at this level is to answer routine questions and to track the flow of transactions through the organization.

- At the operational level, tasks, resources, and goals are predefined and highly structured.
- Managers need TPS to monitor the status of internal operations and the firm's relationship with its external environment.
- TPS are major producers of information for other types of systems.
- Transaction processing systems are often so central to a business that TPS failure for a few hours can lead to a firm's demise and perhaps that of other firms linked to it.

Describe the characteristics of management information systems (MIS), decision support systems (DSS), and executive support systems (ESS) and explain how each type of system helps managers make decisions.

Middle management needs systems to help with monitoring, controlling, decision-making, and administrative activities.

- MIS provide middle managers with reports on the organization's current performance. This information is used to monitor and control the business and predict future performance.
- MIS summarize and report the company's basic operations using data supplied by TPSs. The basic transaction data from TPS are compressed and usually presented in reports that are produced on a regular schedule.
- MIS serve managers primarily interested in weekly, monthly, and yearly results, although some MIS enable managers to drill down to see daily or hourly data if required.
- MIS generally provide answers to routine questions that have been specified in advance and have a predefined procedure for answering them.
- MIS systems generally are not flexible and have little analytical capability.
- Most MIS use simple routines, such as summaries and comparisons, as opposed to sophisticated mathematical models or statistical techniques.

Examples include sales and profit per customer and per region, relocation summary and analysis, inventory control, capital investment analysis, and even a report on students who were here in the autumn but did not to return in the spring.

While MIS have an internal orientation, DSS will often use data from external sources, as well as data from TPS and MIS. DSS supports "what-if" analyses rather than a long-term structured analysis of MIS. MIS are generally not flexible and provide little analytical capabilities. In contrast, DSS are designed for analytical purposes and are flexible.

Decision-support systems (DSS) support nonroutine decision-making for middle managers.

- DSS provide sophisticated analytical models and data analysis tools to support semistructured and unstructured decision-making activities.
- DSS use data from TPS, MIS, and external sources, in condensed form, allowing decision makers to perform “what-if” analysis.
- DSS focus on problems that are unique and rapidly changing; procedures for arriving at a solution may not be fully predefined.
- DSS are designed so that users can work with them directly; these systems include interactive, user-friendly software.

Executive support systems help senior managers address strategic issues and long-term trends, both in the firm and in the external environment.

- ESS address nonroutine decisions requiring judgment, evaluation, and insight because there is no agreed-on procedure for arriving at a solution.
- ESS provide a generalized computing and communications capacity that can be applied to a changing array of problems.
- ESS are designed to incorporate data about external events, such as new tax laws or competitors, but they also draw summarized information from information from internal MIS and DSS.
- ESS are designed for ease-of-use and rely heavily on graphical presentations of data.

3. How do systems that link the enterprise improve organizational performance?

Explain how enterprise applications improve organizational performance.

An organization operates in an ever-increasing competitive and global environment. The successful organization focuses on the efficient execution of its processes, customer service, and speed to market. Enterprise applications provide an organization with a consolidated view of its operations across different functions, levels, and business units. Enterprise applications allow an organization to efficiently exchange information among its functional areas, business units, suppliers, and customers.

Define enterprise systems, supply chain management systems, customer relationship management systems, and knowledge management systems, and describe their business benefits.

Enterprise systems integrate the key business processes of an organization into a single central data repository. This makes it possible for information that was previously fragmented in different systems to be shared across the firm and for different parts of the business to work more closely together.

This changes the work flow of an organization:

- Information flows seamlessly throughout an organization, improving coordination, efficiency, and decision making.
- Gives companies the flexibility to respond rapidly to customer requests while producing and stocking only that inventory necessary to fulfill existing orders.

- Increases customer satisfaction by improving product shipments, minimizing costs, and improving a firm's performance.
- Improves decision making by improving the quality of information for all levels of management. That leads to better analyses of overall business performance, more accurate sales and production forecasts, and higher profitability.

In short, **supply chain management systems** help businesses better manage relationships with their suppliers. Objective of SCM: get the right amount of products from the companies' source to their point of consumption with the least amount of time and with the lowest cost. SCM provide information to help suppliers, purchasing firms, distributors, and logistics companies share information about orders, production, inventory levels, and delivery of products and services so that they can source, produce, and deliver goods and services efficiently. SCM helps organizations achieve great efficiencies by automating parts of these processes or by helping organizations rethink and streamline these processes. SCM is important to a business because through its efficiency it can coordinate, schedule, and control the delivery of products and services to customers.

Business benefits include:

- Decide when and what to produce, store, and move
- Rapidly communicate orders
- Track the status of orders
- Check inventory availability and monitor inventory levels
- Reduce inventory, transportation, and warehousing costs
- Track shipments
- Plan production based on actual customer demand
- Rapidly communicate changes in product design

Customer relationship management systems enable a business to better manage its relationships with existing and potential customers. With the growth of the Web, potential customers can easily comparison shop for retail and wholesale goods and even raw materials, so treating customers better has become very important.

Business benefits include:

- CRM systems provide information to coordinate all the business processes that deal with customers in sales, marketing, and service to optimize revenue, customer satisfaction, and customer retention. This information helps firms identify, attract, and retain the most profitable customers; provide better service to existing customers; and increase sales.
- CRM systems consolidate customer data from multiple sources and provide analytical tools for answering questions such as: What is the value of a particular customer to the firm over his/her lifetime?
- CRM tools integrate a business's customer-related processes and consolidate customer information from multiple communication channels, giving the customer a consolidated view of the company.
- Detailed and accurate knowledge of customers and their preferences helps firms increase the effectiveness of their marketing campaigns and provide higher-quality customer service and support.

Knowledge management systems enable organizations to better manage processes for capturing and applying knowledge and expertise. These systems collect all relevant knowledge and experience in the firm, and make it available wherever and whenever it is needed to improve business processes and management decisions. They also link the firm to external sources of knowledge.

- KMS support processes for acquiring, storing, distributing, and applying knowledge, as well as processes for creating new knowledge and integrating it into the organization.
- KMS include enterprise-wide systems for managing and distributing documents, graphics, and other digital knowledge objects; systems for creating corporate knowledge directories of employees with special areas of expertise; office systems for distributing knowledge and information; and knowledge work systems to facilitate knowledge creation.
- KMS use intelligent techniques that codify knowledge and experience for use by other members of the organization and tools for knowledge discovery that recognize patterns and important relationships in large pools of data.

Explain how intranets and extranets help firms improve business performance.

Because intranets and extranets share the same technology and software platforms as the Internet, they are easy and inexpensive ways for companies to increase integration and expedite the flow of information within the company (intranets alone) and with customers and suppliers (extranets). They provide ways to distribute information and store corporate policies, programs, and data. Both types of nets can be customized by users and provide a single point of access to information from several different systems. Businesses can connect the nets to transaction processing systems easily and quickly. Interfaces between the nets and TPS, MIS, DSS, and ESS systems provide input and output for users.

4. Why are systems for collaboration and teamwork so important and what technologies do they use?

Define collaboration and teamwork and explain why they have become so important in business today.

Collaboration is working with others to achieve shared and explicit goals. It focuses on task or mission accomplishment and usually takes place in a business, or other organization, and between businesses. Collaboration can be short-lived or longer term, depending on the nature of the task and the relationship among participants. It can be one-to-one or many-to-many.

Teamwork is part of the organization's business structure for getting things done. They have a specific mission. The members of a team need to collaborate on the accomplishment of specific tasks and collectively achieve the team mission. Teams are often short-lived, depending on the problems they tackle and the length of time needed to find a solution and accomplish the mission.

Collaboration and teamwork are important because:

- *Changing nature of work.* More jobs are becoming “interaction” jobs. These kinds of jobs require face-to-face interaction with other employees, managers, vendors, and customers. They require systems that allow the interaction workers to communicate, collaborate, and share ideas.
- *Growth of professional work.* Professional jobs in the service sector require close coordination and collaboration.
- *Changing organization of the firm.* Work is no longer organized in a hierarchical fashion as much as it is now organized into groups and teams who are expected to develop their own methods for accomplishing tasks.
- *Changing scope of the firm.* Work is more geographically separated than before.
- *Emphasis on innovation.* Innovation stems more from groups and teams than it does from a single individual.
- *Changing culture of work and business.* Diverse teams produce better outputs, faster, than individuals working on their own.

List and describe the business benefits of collaboration.

The general belief is that the more a business firm is collaborative in nature, the more successful it will be and that collaboration within and among firms is more essential than in the past. The overall economic benefit of collaboration is significant.

The business benefits of collaboration are listed in Table 2.2, page 58:

- *Productivity:* People working together accomplish tasks faster, with fewer errors, than those working alone.
- *Quality:* People can communicate errors and correct them faster when working together versus working alone.
- *Innovation:* People working in groups can generate more innovative ideas than if they were working alone.
- *Customer service:* People working in teams can solve customer complaints and issues faster and more effectively versus working in isolation.
- *Financial performance:* Collaborative firms have superior sales, sales growth, and financial performance.

Describe a supportive organization culture for collaboration.

Historically, organizations were built on hierarchies which did not allow much decision making, planning, and organizing at lower levels of management or by employees. Communications were generally vertical through management levels rather than horizontal between groups of employees.

A collaborative culture relies on teams of employees to implement and achieve results for goals set by senior managers. Policies, products, designs, processes, and systems are much more dependent on teams at all levels of the organization to devise, to create, and to build. Rather than employees being rewarded for individual results, they are rewarded based on their performance in a team. The function of middle managers in a collaborative business culture is to build the teams, coordinate their work, and monitor their performance. In a

collaborative culture, senior management establishes collaboration and teamwork as vital to the organization, and it actually implements collaboration for the senior ranks of the business as well.

List and describe the various types of collaboration and communication systems.

Enterprise-wide information systems businesses can use the following to support interaction jobs:

- Internet-based collaboration environments like Lotus Notes, Groove, and WebEx provide online storage space for documents, team communications (separated from email), calendars, and audio-visual tools members can use to meet face-to-face.
- Email and Instant Messaging (IM) are reliable methods for communicating whenever and wherever around the globe.
- Cell phones and wireless handhelds give professionals and other employees an easy way to talk with one another, with customers and vendors, and with managers. These devices have grown exponentially in sheer numbers and in applications available.
- Social networking is no longer just “social.” Businesses are realizing the value of providing easy ways for interaction workers to share ideas and collaborate with each other.
- Wikis are ideal tools for storing and sharing company knowledge and insights. They are often easier to use and cheaper than more proprietary knowledge management systems. They also provide a more dynamic and current repository of knowledge than other systems.
- Virtual worlds house online meetings, training sessions, and “lounges” where real-world people meet, interact, and exchange ideas.
- Google Apps/Google sites allow users to quickly create online group-editable Web sites.
- Microsoft SharePoint software makes it possible for employees to share their Office documents and collaborate on projects using Office documents as the foundation.

5. What is the role of the information systems function in a business?

Describe how the information systems function supports a business.

The information system department is the formal organizational unit responsible for information technology services. The information systems department is responsible for maintaining the hardware, software, data storage, and networks that comprise the firm’s IT infrastructure.

Compare the roles played by programmers, systems analysts, information systems managers, the chief information officer (CIO), chief security officer (CSO), chief knowledge officer (CKO).

- Programmers are highly trained technical specialists who write the software instructions for computers.

- Systems analysts constitute the principal liaisons between the information systems groups and the rest of the organization. The systems analyst's job is to translate business problems and requirements into information requirements and systems.
- Information systems managers lead teams of programmers and analysts, project managers, physical facility managers, telecommunications managers, or database specialists.
- Chief information officer (CIO) is a senior manager who oversees the use of information technology in the firm.
- Chief security officer (CSO) is responsible for information systems security in the firm and has the principle responsibility for enforcing the firm's information security policy. The CSO is responsible for educating and training users and IS specialists about security, keeping management aware of security threats and breakdowns, and maintaining the tools and policies chosen to implement security.
- Chief knowledge officer (CKO) helps design programs and systems to find new sources of knowledge or to make better use of existing knowledge in organizational and management processes.

Discussion Questions

- 1. How could information systems be used to support the order fulfillment process illustrated in Figure 2.2? What are the most important pieces of information these systems should capture? Explain your answer.**

Today's systems are built to electronically coordinate all the business functions in an enterprise. The sales function begins the process by completing a sales order, electronically inputting the data into the system. The sales system updates daily sales totals and decreases inventory. The accounting department electronically receives the order and runs a credit check. If the credit is not approved, system sends an exception notification to an accounting specialist and the sales person. If credit is approved, the order is sent to the manufacturing and production system and product assembly begins. When the product is completed, electronic shipping documents are prepared and logistics is notified. When the product is shipped, electronic notifications are sent to Sales, Manufacturing and Production, Accounting, and the customer. The system electronically bills the customer.

- 2. Identify the steps that are performed in the process of selecting and checking a book out from your college library and the information that flows among these activities. Diagram the process. Are there any ways this process could be improved to improve the performance of your library or your school? Diagram the improved process.**

Students should rely on information from Section 2.1, Components of a Business, and specifically the information from "*Business Processes*," to answer this question. Figure 2.2, page 41, should serve as a guide for diagramming the library fulfillment process as it currently may exist. Information from "*How Information Technology Enhances Business Processes*" can help *students* diagram the improved process.

3. How might the BMW Oracle team have used collaboration systems to improve the design and performance of the *America's Cup* sailboat USA? Which system features would be the most important for these tasks?

First, students should use Table 2.3, page 59, to evaluate various collaboration systems, and Figure 2.11, page 64, to help them choose the most appropriate collaboration and teamwork tools for the tasks. They should then create a list of possibilities to make sure they choose the correct collaboration software at an affordable price and within the team's risk tolerance.

The BMW Oracle sailing team required collaboration systems to perform the following tasks: using presentation graphics, sharing data analysis, training the crew, changing and refining the design of the vessel, and revising processes and procedures. The tools necessary to carry out those tasks include:

- Email and instant messaging
- Collaborative writing
- Collaborative reviewing/editing
- File sharing
- Audio and video conferencing
- Document sharing
- Large audience Webinars

Hands-On MIS Projects

Management Decision Problems

- 1. Don's Lumber Company:** Manual price sheets must be frequently updated. That leads to slower sales processes, pricing errors if sales reps are using outdated information, and customer dissatisfaction due to delays in obtaining information. By putting the data online using an extranet and updating it as necessary, sales reps consult the most current information immediately. That leads to faster sales and more satisfied customers. Necessary decisions include how much information to make available online, who will have access to it, and how to keep the information secure. Senior management would likely make these decisions.
- 2. Henry's Hardware:** Owners do not keep automated, detailed inventory or sales records. Invoices are not maintained or tracked (other than for tax purposes). The owners use their own judgment in identifying items that need to be reordered. What is the business impact of this situation? How could information systems help Henry and Kathleen run their business? What data should these systems capture? What decisions could the systems improve?

The business impact includes lost sales, over- and under-ordering products, improper sales accounting and more costly inventory control. An information system could capture data that allows owners to maintain proper inventories, order only those products needed, and ensure proper sales accounting. Decisions on pricing, product levels, and inventory replenishment could be vastly improved based on data and not a best-guess venture.

Improving Decision Making: Use a Spreadsheet to Select Suppliers

Software skills: Spreadsheet date functions, data filtering, DAVERAGE functions.

Business skills: Analyzing supplier performance and pricing.

Although the format of the student's answers will vary, a suggested solution can be found in the Microsoft Excel File named: *MIS10ch02_solutionfile.xls*.

This exercise requires some student knowledge of spreadsheet database functions. At a minimum, students should know how to sort the database by various criteria such as item description, item cost, vendor number, vendor, name, or A/P terms. Students may need to be told that A/P Terms is expressed as the number of days that the customer has to pay the vendor for a purchase. In other words, 30 designates net 30 days. The vendor that allows customers the longest amount of time to pay for an order would, of course, offer the most favorable payment terms.

Students will need to add additional columns for calculating the actual delivery time for each order and the number of days the delivery is late. The Actual Delivery Time can be calculated by subtracting the Promised Ship Date from the Arrival Date. The number of days late can be calculated by subtracting the Promised Transit Time from the Actual Delivery Time. If the number of days late is negative, it indicates that the order arrived early.

These numbers are useful when trying to determine who is the vendor with the best on-time delivery track record. Students can use the DAVERAGE function to determine the average delivery time for each vendor. Students can also use one of the database functions to determine the vendor with the best accounts payable terms. To determine the vendor with the lowest prices for the same item when it is supplied by multiple vendors, students can filter the database using the item description. This filtered list can then be sorted by item cost and vendor number.

Achieving Operational Excellence: Using Internet Software to Plan Efficient Transportation Routes

Obviously, the shortest amount of time is more cost effective than the shortest distance since there's only a difference of 27.05 miles. Saving the 27 miles will take 2 hours, 24 minutes longer. Encourage students to use the Advanced Tools option to quickly change back and forth between "shortest time" and "shortest distance." Only to show how convenient these kinds of online tools are, ask students to use a regular map and calculator to draw out the two routes. (Lots of ughs!)

Shortest Distance: 10 hours, 11 min; 506.56 miles

Shortest time: 8 hours, 35 minutes; 533.61 miles

Video Case Questions

You will find a video case illustrating some of the concepts in this chapter on the Laudon Web site at www.pearsonhighered.com/laudon along with questions to help you analyze the case.

Collaboration and Teamwork: *Describing Management Decisions and Systems*

With a group of three or four other students, find a description of a manager in a corporation in *Business Week*, *Fortune*, the *Wall Street Journal*, or another business publication or do your research on the Web. Gather information about what the manager's company does and the role he or she plays in the company. Identify the organizational level and business function where this manager works. Make a list of the kinds of decisions this manager has to make and the kind of information that manager would need for those decisions. Suggest how information systems could supply this information. If possible, use Google Sites to post links to Web pages, team communication announcements, and work assignments. Try to use Google Docs to develop a presentation of your findings for the class.

Group answers will vary because students will select different companies and different managerial levels. The major element of this project is making sure the students select the appropriate type of information system for the level of management that they are evaluating.

Clearly, students would not list TPS as a system that would be used by a senior manager. It would be acceptable if they suggested a senior manager using an MIS, DSS, or ESS. What should be apparent in the answer is that an executive senior manager is mainly focused on the long-term direction and viability of the company. A few things that students might mention would be that a senior executive would be concentrating on issues such as plant expansion or closures, foreign market opportunities, or new markets at home, changes in market trends and interest rates, overall economic outlook, changes in stocks prices, threats or opportunities that may be taking place in the market, and political changes.

Business Problem-Solving Case: *Collaboration and Innovation at Procter & Gamble*

1. What is Procter & Gamble's business strategy? What is the relationship of collaboration and innovation to that business strategy?

P&G's business operations are divided into three main units: Beauty Care, Household Care, and Health and Well-Being, each of which are further subdivided into more specific units. In each of these divisions, P&G has three main focuses as a business:

- Maintain the popularity of its existing brands, via advertising and marketing
- Extend its brands to related products by developing new products under those brands
- Innovate and create new brands entirely from scratch

Having R&D teams spread throughout 30 sites globally, P&G is in strong need of collaboration tools that allow researchers, marketers, and managers to easily gather, store, and share knowledge and information. At 3.4 percent of revenue, P&G spends more than twice the industry average on innovation to support its business strategies.

2. How is P&G using collaboration systems to execute its business model and business strategy? List and describe the collaboration systems and technologies it is using and the benefits of each.

To support the business strategy of innovating and creating new brands entirely from scratch, P&G must find the right tools to support collaboration and innovation. Some of the collaboration system the company's employees and partners use are:

- Social networking and collaborative tools popularized by Web 2.0: Allows researchers and scientists from inside and outside the company to work together more easily and efficiently while reducing research and development costs.
- Microsoft services that include instant messaging, unified communications, Microsoft Live Communications Server functionality, Web conferencing with Live Meeting, and content management with SharePoint: Reduces the time and effort necessary to share data and information between employees and others involved in the company's R&D effort. For instance, marketers can access data from researchers and create highly targeted ad campaigns.

3. What problems do collaboration systems solve for P&G?

Because so much of P&G's business is built around brand creation and management, it's critical that the company facilitate collaboration between researchers, marketers, and managers. And because P&G is such a big company, and makes such a wide array of products, achieving these goals is a daunting task.

The company relied on email exchanges for colleagues to communicate but it was too slow, too cumbersome, and not versatile enough. Blogs and other collaborative tools are open to anyone interested in their content and attract comments from interested users.

4. Why were some collaborative technologies slow to catch on at P&G?

P&G is no different than most companies when it comes to introducing new systems to employees who are used to the comfort of familiar methods and tools. In short, most people resist change whenever they can. Email was the primary method of disseminating information among researchers and scientists. It was proving to be too slow and a very cumbersome way to reach those who needed the information most. Employees have resisted the new collaborative technologies claiming the tools have added more work rather than reducing it.

The networked collaborative tools and technologies P&G introduced rely on an ever-increasing number of people using them. The more people that engage in the network the better the network becomes. To make the new technologies successful, P&G employees had to grow the database of information and continually improve the knowledge base making it even more attractive to a wider audience of users.

5. Compare P&G's old and new processes for writing up and distributing the results of a research experiment.

Researchers used “old-fashioned” glue to compile information into traditional notebooks, which were passed to only a few colleagues. An executive entered data into PowerPoint slides and emailed them to those he thought were interested in the information. The slides were emailed numerous times by others, with some receiving multiple copies of the same file.

P&G’s IT department creates Microsoft SharePoint pages where researchers, executives, employees, and business partners can post documents, spreadsheets, slide presentations, and other forms of information for anyone to access and use. It’s a much more efficient and effective method of collecting, storing, and disseminating information throughout the organization.

The company uses InnovationNet, a collaborative tool that allows users to access over 5 million research-related documents via a browser-based portal.

Rather than use cumbersome email exchanges, employees use blogs and other collaborative tools to communicate with each other.

6. Why would telepresence be such a useful collaborative tool for a company like P&G?

Because P&G has employees located in more than 80 countries, it just doesn’t make sense not to use telepresence technologies as a way to easily bring research and development teams together. P&G required Cisco to build individual studios to particular specifications that portrayed the distinct characteristics of each location. That helps make users more comfortable and more accurately reflects the diversity of employees at each location. Telepresence technologies have greatly improved over the years while the costs of implementing and operating the conference rooms have been significantly reduced. The usage of telepresence technologies throughout P&G ranges from 35 to 70 percent. The time it takes to make decisions has shrunk from days to minutes thanks to telepresence technologies.

7. Can you think of other ways P&G could use collaboration to foster innovation?

P&G could use intranets and extranets to collect information in one place and in one basic format. The nets would be accessible to anyone at any time. YouTube type videos and large audience Webinars can be used for training. Wikis can be used as a repository for knowledge management allowing information to be collaboratively reviewed and edited.