Business Information Systems

2
SECTION

Organizations utilize various types of information systems to help run their daily operations. These systems are primarily transactional systems that concentrate on the management and flow of low-level data items pertaining to basic business processes such as purchasing and order delivery. This data is often rolled-up and summarized into higher-level decision support systems to help firms understand what is happening in their organizations and how best to respond. In order to achieve seamless handling of this data, organizations must ensure that their business information systems are tightly integrated across the enterprise. Doing so allows organizations to manage and process basic business processes as efficiently and effectively as possible and to make better informed decisions.

The purpose of this section of the textbook is to highlight the various types of business information systems found in organizations and how they relate to one another. The chapters found within this section speak to various types of business information systems and their role in helping firms reach their strategic goals. Though each chapter is devoted to a specific type of business information system (e.g., those used for strategic decision making, supply chain management, customer relationship management, and enterprise resource planning), bear in mind that these systems must work in tandem with each other so that organizations will be better prepared to meet their strategic business goals and outperform their competitors.

3 CHAPTER

Strategic Decision Making

LEARNING OUTCOMES

3.1. Explain the difference between transactional information and analytical information. Be sure to provide an example of each.

3.2. Define TPS, DSS, and EIS and explain how an organization can use these systems to make decisions and gain competitive advantages.

3.3. Describe the three quantitative models typically used by decision support systems.

3.4. Describe the relationship between digital dashboards and executive information systems.

3.5. Identify the four types of artificial intelligence systems.

3.6. Describe the four basic components of supply chain management.

3.7. Explain customer relationship management and the benefits it can provide to an organization.

3.8. Define enterprise resource planning and explain its importance to an organization.

3.9. Identify how an organization can use business process reengineering to improve its business.

Why Do I Need To Know This?

This chapter describes various types of business information systems found across the enterprise used to run basic business operations and used to facilitate sound and proper decision making. An overview is given first on decision-making information systems and then later on the various kinds of enterprise systems typically found in organizations.

As a business student, you need to know what types of information systems exist in an enterprise as a first step towards understanding how to utilize these systems to improve organizational performance. From this chapter, you will gain an appreciation for the various kinds of information systems employed by organizations and how they can be utilized to help organizations make strategically informed decisions.

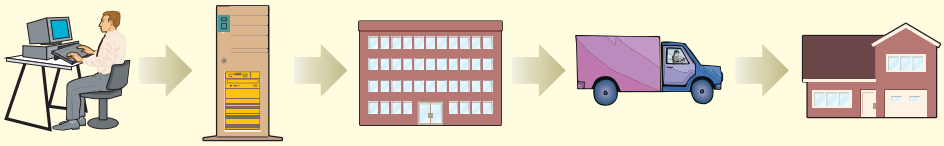
Better yet, you will get a taste of the complexity and importance of integrating these various systems together. As a business student, you should recognize the importance of integrating various types of business information systems to help improve organizational decision making. This chapter should help pave the way.

opening case study

Information Systems are Central at Grocery Gateway

Grocery Gateway is Canada's leader in online retailing of home and office delivered groceries. Founded by a group of entrepreneurs who had the idea that people had better things to do in life than grocery shop, Grocery Gateway started out with only a handful of employees and a couple of rental trucks. In 2004, Grocery Gateway was acquired by Longo Brothers Fruit Market Inc., a family-owned independent grocery business that has operated physical groceries stores since 1956.[1] Today, Grocery Gateway has successfully secured the business of literally over 100,000 registered customers throughout the Greater Toronto Area. Quite a bit of growth for a start-up company founded only in 1997 by a bunch of classmates and rugby mates in a basement of a house.

Like other online grocers, Grocery Gateway's strategy is all about the last mile of service. Online grocers sell groceries over the Internet and deliver them directly to the door. In this sense, groceries are used to initiate the customer relationship and create a pipeline to the home. The online grocer then leverages this pipeline to introduce complimentary products to the consumer.[2]



What is attractive to consumers is that the online grocery store is open 24 hours, 7 days a week, and that there is greater simplicity in clicking a mouse to get the food you want over that of trekking down to a physical store and pushing a grocery cart. Though prices are competitive with supermarkets, price is not the value proposition for the online grocery shopper. Rather, for the consumer, shopping online for groceries is a time-saver. Consumers—generally busy people with not enough time on their hands—are looking to find easier and quicker ways to do chores, like grocery shopping. Also, people who find it physically challenging to do grocery shopping (such as the elderly and the disabled), as well as those who choose not to own a car, find the service that Grocery Gateway provides to be quite beneficial.

Information Systems are the Heart of the Business

Online grocers realize the critical role information systems play in the health and viability of their electronic business. Technology is used to host a Web site that supports online merchandising, single item picking, home delivery operations, and customer service. For example, Grocery Gateway has built in several key features in its Web site to attract and retain its customers. This includes offering an online shopping demo, a getting-started tutorial, and e-mail customer support. Moreover, the Web site offers a full suite of electronic commerce functionality that allows consumers to browse or find grocery items, see pictures and descriptions of product items (including their price), and to select items in a shopping basket and to check out those items for delivery.[3] To work effectively, the various functions built into the Web site, such as item searching, grocery ordering, customer profiling, electronic payments, and delivery scheduling must be tightly integrated and coordinated with one another in order for the Web site to function as a cohesive whole.

Using Information Systems to Manage Logistics

A key information system utilized by online grocers is their underlying logistics management systems. For example, Grocery Gateway is well aware that what will make or break this company is the logistics of quick delivery. As such, the company has turned to Cube Route, an on-demand logistics management solutions provider, to optimize Grocery Gateway's selection of delivery routes. The goal is to maximize efficiency in route selection by incorporating historical delivery data with real-time information into route selection determination. Real-time data is achieved through a combination of sophisticated routing, tracking, planning, and dispatching functionality. The technology allows Grocery Gateway to guarantee its customers a specific 90-minute window of delivery of groceries to their doors. This 90-minute window is much narrower than other retail delivery operations.

Imagine the complexity of coordinating the delivery of groceries. With thousands of active customers, Grocery Gateway delivery trucks make roughly 500 stops to customer homes and offices per day. Cube Route's logistic management software ensures that these orders are delivered within the 90-minute window. To do so, the software needs to take into account unpredictable delays, such as traffic jams and road accidents, as well as last minute customer requests or cancellations. GPS-enabled mobile phones allow the logistics software to know the exact position and location of Grocery Gateway drivers to make the best decisions on routes for drivers to follow.

The use of Cube Route's software has improved the bottom line. Since deploying the Cube Route solution, Grocery Gateway has improved its on-time delivery performance by 14 percent and is exceeding its yearly stops per paid hour by 12.4 percent.[4]

The Effective Use of Information Systems Will Enable Online Grocers to Succeed

Online grocers face significant challenges. A recent electronic commerce research study suggests that the challenge for online grocery retailers is to convey the specific benefits of shopping online to the public and to offer potential customers more reasons to use the channel.[5] Of relevance, the study suggests that online grocery retailers should be looking to improve ordering processes and delivery mechanisms as means to secure a solid and repeating customer base. With Grocery Gateway's strategy to offer customers a fully-enabled electronic commerce interface and to utilize state-of-the art logistics management software, the company is taking the right steps to succeed.

3.1 DECISION-MAKING SYSTEMS

Decision-making and problem-solving abilities are now the most sought-after traits in up-and-coming executives, according to a recent survey of 1,000 executives. To put it mildly, decision makers and problem solvers have limitless career potential.[6]

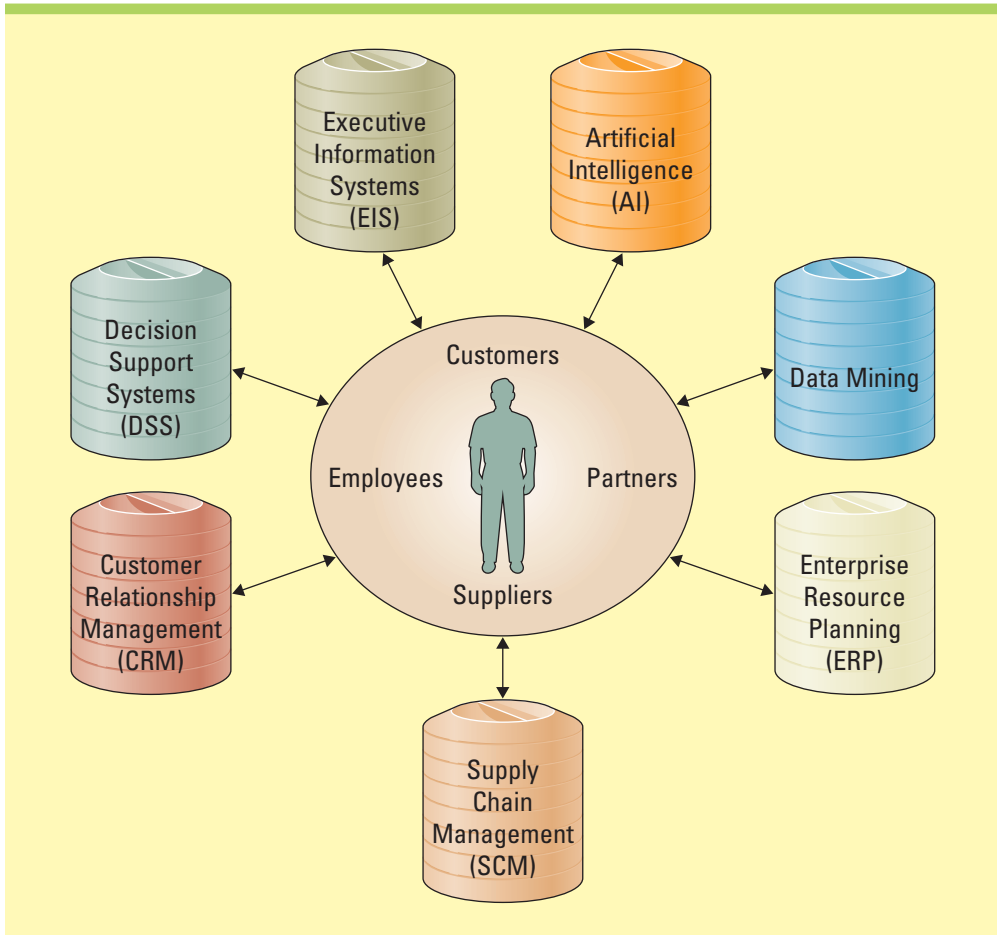
Decision making and problem solving in today's electronic world encompass large-scale, opportunity-oriented, strategically focused solutions. The traditional "cookbook" approach to decision making simply will not work. This chapter focuses on technology to help make decisions, solve problems, and find new innovative opportunities. The chapter also highlights how to bring people together with the best IT processes and tools in complete, flexible solutions that can seize business opportunities and combat business challenges (see Figure 3.1).

DECISION MAKING

What is the value of information? The answer to this important question varies. Karsten Solheim would say the value of information is its ability to lower a company's handicap. Solheim, an avid golfer, invented a putter, one with a "ping," that led to a successful golf equipment company and the PING golf clubs. PING Inc., a privately held corporation, was the first to offer customizable golf clubs. The company prides itself on being a just-in-time manufacturer that depends on flexible information systems to make informed production decisions. PING's production systems scan large amounts of information and pull orders that meet certain criteria such as order date (this week), order priority (high), and customer type (Gold). PING then manufactures the appropriate products,

FIGURE 3.1

Examples of Decision-Making Systems



allowing it to carry less than 5 percent of inventory in its warehouse. PING depends on its flexible information systems for production decision support and thanks information technology for the explosion of its business over the past decade.[7]

Business is accelerating at a breakneck pace. The more information a business acquires, the more difficult it becomes to make decisions. The amount of information people must understand to make good decisions is growing exponentially. In the past, people could rely on manual processes to make decisions because they had limited amounts of information to process. Today, with massive volumes of available information it is almost impossible for people to make decisions without the aid of information systems. Highly complex decisions—involving far more information than the human brain can comprehend—must be made in increasingly shorter time frames. Figure 3.2 highlights the primary reasons dependence on information systems to make decisions is growing and will continue to grow.

A ***model*** is a simplified representation or abstraction of reality. Models can calculate risks, understand uncertainty, change variables, and manipulate time. Decision-making information systems work by building models out of organizational information to lend insight into important business issues and opportunities. Figure 3.3 displays three common types of decision-making information systems used in organizations today—transaction processing systems, decision support systems, and executive information systems. Each system uses different models to assist in decision making, problem solving, and opportunity capturing.

Though each system uses different models, it is important to understand that these various decision-making information systems need to be tightly integrated

Reasons for Growth of Decision-Making Information Systems
1. **People need to analyze large amounts of information**—Improvements in technology itself, innovations in communication, and globalization have resulted in a dramatic increase in the alternatives and dimensions people need to consider when making a decision or appraising an opportunity.
2. **People must make decisions quickly**—Time is of the essence and people simply do not have time to sift through all the information manually.
3. **People must apply sophisticated analysis techniques, such as modelling and forecasting, to make good decisions**—Information systems substantially reduce the time required to perform these sophisticated analysis techniques.
4. **People must protect the corporate asset of organizational information**—Information systems offer the security required to ensure organizational information remains safe.

FIGURE 3.2

Primary Reasons for Growth of Decision-Making Information Systems

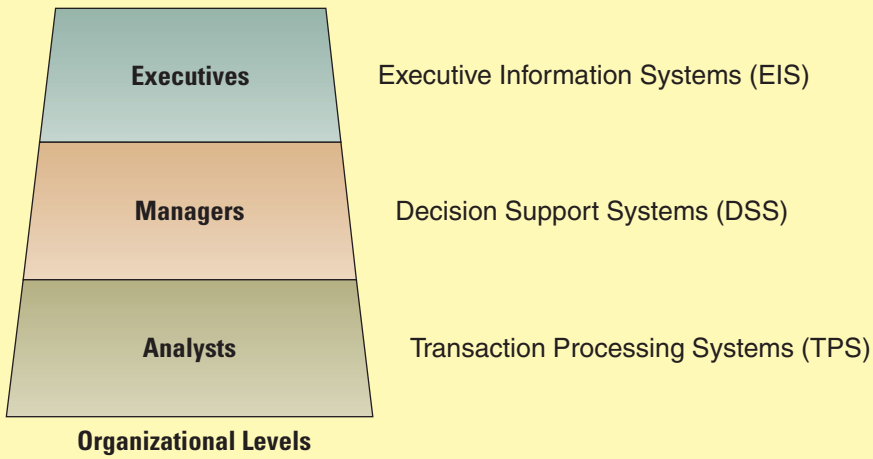


FIGURE 3.3

IT Systems in an Enterprise

in order for proper and sound decision making to occur and that the underlying data found in transaction processing systems must be accurate and reliable in order for higher-level decision-making systems to be effective. The reason for this is that data stored in lower-level transaction processing systems are often used to source the information contained in higher-level decision-making systems. Thus, it is imperative that transactional data is accurate and reliable, and that the information in these systems is consistent across the enterprise. Otherwise, the information used from these systems by higher-end executive and decision-making systems will be in error, potentially leading to misguided decisions by management. This could steer the organization off-course in reaching its strategic goals and objectives—not a position any firm wants to be in.

TRANSACTION PROCESSING SYSTEMS

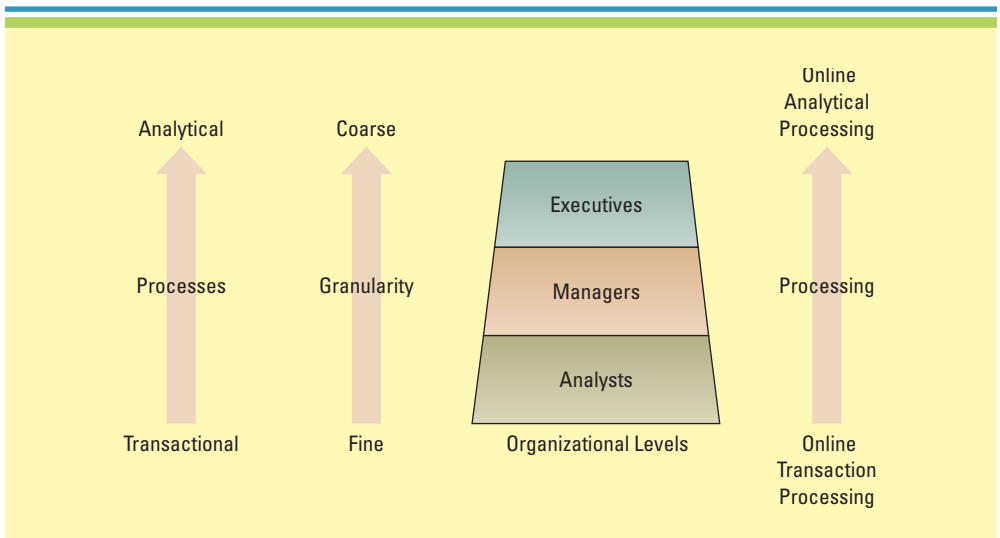
Transactional information encompasses all of the information contained within a single business process or unit of work, and its primary purpose is to support the performing of daily operational tasks. Examples of transactional information include purchasing stocks, making an airline reservation, or withdrawing cash from an ATM. Organizations use transactional information when performing operational tasks and repetitive decisions such as analyzing daily sales reports to determine how much inventory to carry.

Analytical information encompasses all organizational information, and its primary purpose is to support the performing of managerial analysis tasks. Analytical information includes transactional information along with other information such as market and industry information. Examples of analytical information include trends, sales, product statistics, and future growth projections. Managers use analytical information when making important ad hoc decisions such as whether the organization should build a new manufacturing plant or hire additional sales personnel.

The structure of a typical organization is similar to a pyramid. Organizational activities occur at different levels of the pyramid. People in the organization have unique information needs and thus require various sets of IT tools (see Figure 3.4). At the lower levels of the pyramid, people perform daily tasks such as processing transactions. ***Online transaction processing (OLTP)*** is the capturing of transaction and event information using technology to (1) process the information according to defined business rules, (2) store the information, and (3) update existing information to reflect the new information. During OLTP, the organization must capture every detail of transactions and events. A ***transaction processing system (TPS)*** is the basic business system that serves the operational level (analysts) in an organization. The most common example of a TPS is an operational accounting system such as a payroll system or an order-entry system.

FIGURE 3.4

Enterprise View of Information and Information Technology



Moving up through the organizational pyramid, people (typically managers) deal less with the details ("finer" information) and more with meaningful aggregations of information ("coarser" information) that help them make broader decisions for the organization. (Granularity means fine and detailed or "coarse" and abstract information.) ***Online analytical processing (OLAP)*** is the manipulation of information to create business intelligence in support of strategic decision making. ***Business intelligence*** is a broad, general term describing information that people use to support their decision-making efforts.

DECISION SUPPORT SYSTEMS

At limousine and transportation company BostonCoach, managers must dispatch fleets of hundreds of vehicles as efficiently as possible. BostonCoach requires a real-time dispatching system that considers inventory, customer needs, and soft dimensions such as weather and traffic. Researchers at IBM's Thomas J. Watson Research Center built BostonCoach a mathematical algorithm for a custom dispatch system that combines information about weather, traffic conditions, driver locations, and customer pickup requests and determines which cars to assign to which customers. The system is so efficient that, after launching it, BostonCoach experienced a 20-percent increase in revenues.[8]

A ***decision support system (DSS)***, such as BostonCoach's, models information to support managers and business professionals during the decision-making process. Three quantitative models often used by DSS include:

1. ***Sensitivity analysis*** is the study of the impact that changes in one (or more) parts of the model have on other parts of the model. Users change the value of one variable repeatedly and observe the resulting changes in other variables.
2. ***What-if analysis*** checks the impact of a change in an assumption on the proposed solution. For example, "What will happen to the supply chain if a blizzard in Alberta reduces holding inventory from 30 percent to 10 percent?" Users repeat this analysis until they understand all the effects of various situations. Figure 3.5

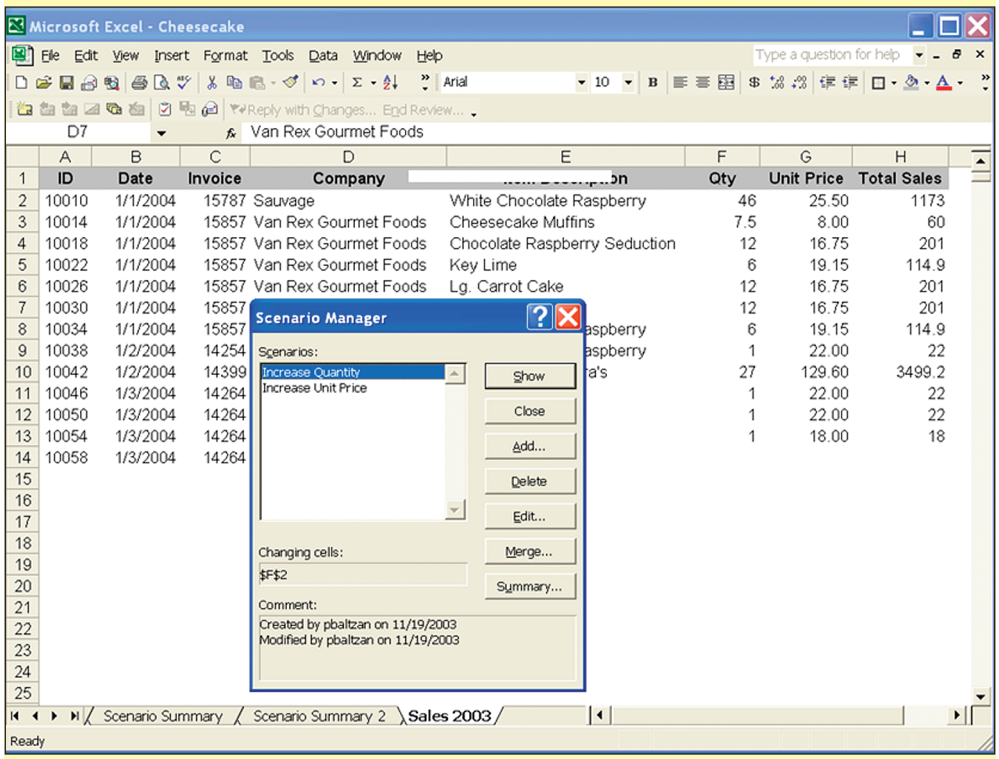


FIGURE 3.5
Example of What-If Analysis in Microsoft Excel

displays an example of what-if analysis using Microsoft Excel. The tool is calculating the net effect of a 20-percent increase in sales on the company's bottom line.

3. ***Goal-seeking analysis*** finds the inputs necessary to achieve a goal such as a desired level of output. Instead of observing how changes in a variable affect other variables as in what-if analysis, goal-seeking analysis sets a target value (a goal) for a variable and then repeatedly changes other variables until the target value is achieved. For example, "How many customers are required to purchase a new product to increase gross profits to $5 million?" Figure 3.6 displays a goal-seeking scenario using Microsoft Excel. The model is seeking the monthly mortgage payment needed to pay off the remaining balance in 130 months.

One national insurance company uses DSSs to analyze the amount of risk the company is undertaking when it insures drivers who have a history of driving under the influence of alcohol. The DSS discovered that only 3 percent of married male homeowners in their forties received more than one DUI. The company decided to lower rates for customers falling into this category, which increased its revenue while mitigating its risk.[9]

Figure 3.7 displays how a TPS is used within a DSS. The TPS supplies transaction-based data to the DSS. The DSS summarizes and aggregates the information from the many different TPS systems, which assists managers in making informed decisions. Canadian Pacific Railway uses a DSS to analyze the movement of all its railcars and to track shipments against delivery commitments. Without this tool, the job of integrating and analyzing transaction-based data would be a difficult task.[10]

EXECUTIVE INFORMATION SYSTEMS

An ***executive information system (EIS)*** is a specialized DSS that supports senior-level executives within the organization. An EIS differs from a DSS because an EIS typically contains data from external sources as well as data from internal sources (see Figure 3.8).

FIGURE 3.6

Example of Goal-Seeking Analysis in Microsoft Excel

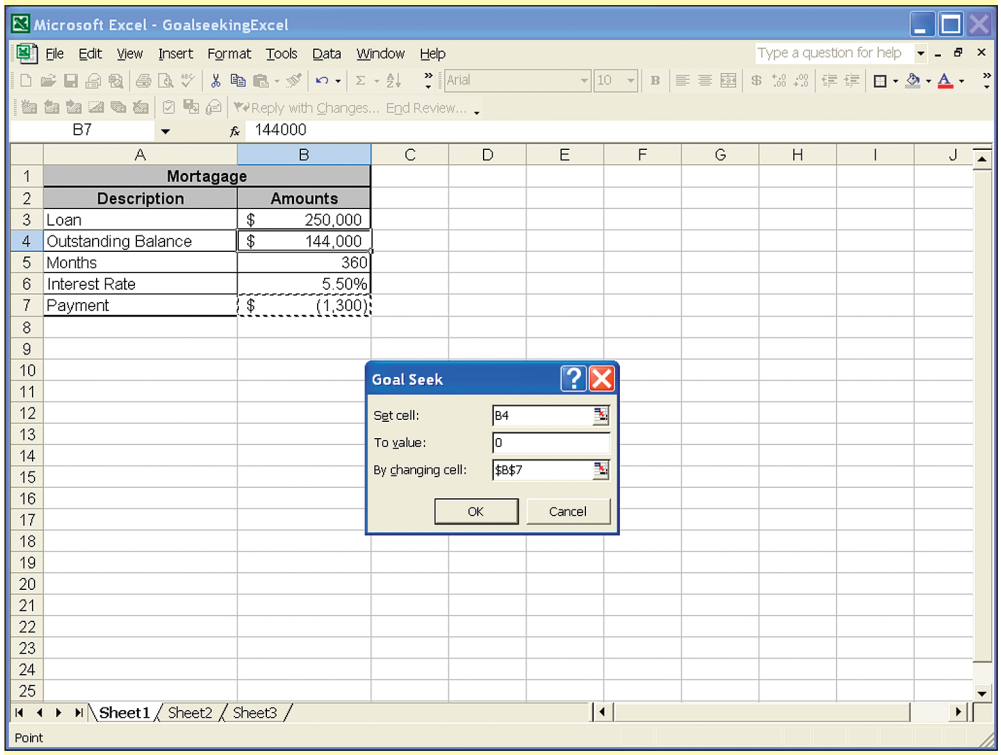
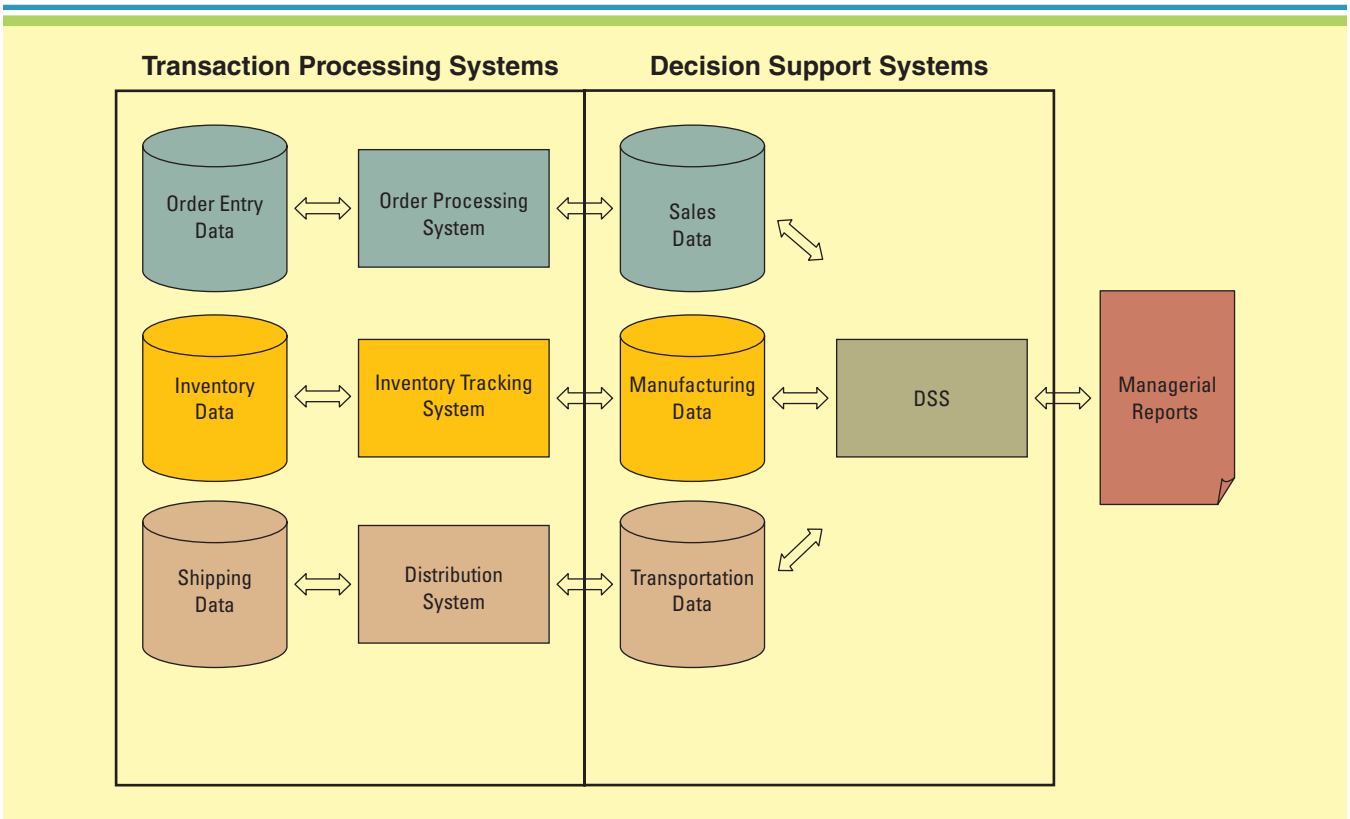


FIGURE 3.7

Interaction Between TPSs and DSSs



Consolidation, drill-down, and slice-and-dice are a few of the capabilities offered in most EISs.

- ***Consolidation*** involves the aggregation of information and features simple roll-ups to complex groupings of interrelated information. Many organizations track financial information at a regional level and then consolidate the information at a single global level.
- ***Drill-down*** enables users to view details, and details of details, of information. Viewing monthly, weekly, daily, or even hourly information represents drill-down capability.
- ***Slice-and-dice*** is the ability to look at information from different perspectives. One slice of information could display all product sales during a given promotion. Another slice could display a single product's sales for all promotions.

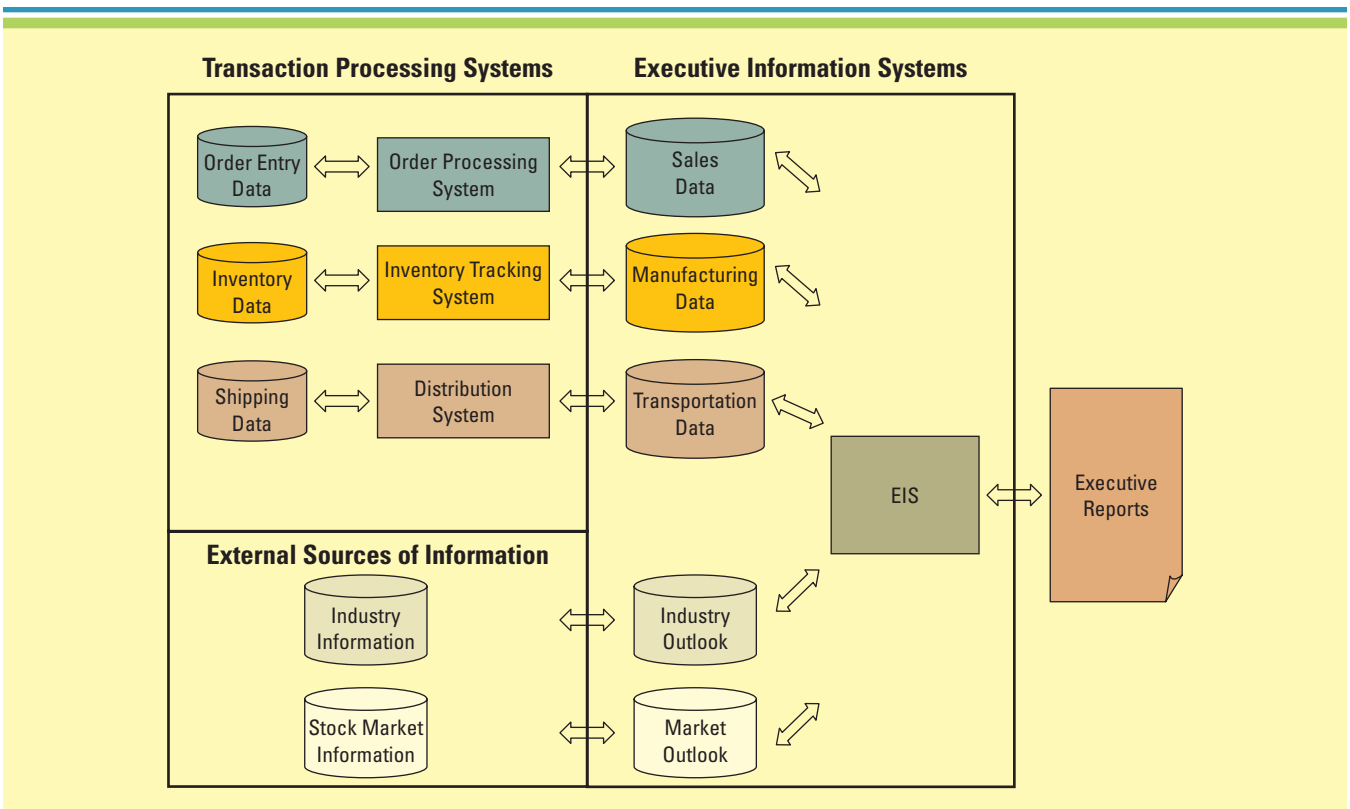
Digital Dashboards

A common feature of an EIS is a digital dashboard. ***Digital dashboards*** integrate information from multiple components and tailor the information to individual preferences. Digital dashboards commonly use indicators to help executives quickly identify the status of key information or critical success factors. Following is a list of features included in a dashboard designed for a senior executive of an oil refinery:

- A hot list of key performance indicators, refreshed every 15 minutes.
- A running line graph of planned versus actual production for the past 24 hours.
- A table showing actual versus forecasted product prices and inventories.
- A list of outstanding alerts and their resolution status.

FIGURE 3.8

Interaction Between TPSs and EISs



- A graph of crude-oil stock market prices.
- A scroll of headline news from Petroleum Company news, an industry news service.

Digital dashboards, whether basic or comprehensive, deliver results quickly. As digital dashboards become easier to use, more executives can perform their own analysis without inundating IT personnel with questions and requests for reports. According to an independent study by Nucleus Research, there is a direct correlation between use of digital dashboards and companies' return on investment (ROI). Figure 3.9 and Figure 3.10 display two different digital dashboards from Visual Mining.

EIS systems, such as digital dashboards, allow executives to move beyond reporting to using information to directly impact business performance. Digital dashboards help executives react to information as it becomes available and make decisions, solve problems, and change strategies daily instead of monthly.

Verizon Communications CIO Shaygan Kheradpir tracks 100-plus major IT systems on a single screen called "The Wall of Shaygan." Every 15 seconds, a new set of charts communicating Verizon's performance flashes onto a giant LCD screen in Kheradpir's office. The 44 screen shots cycle continuously, all day long, every day. The dashboard includes more than 300 measures of business performance that fall into one of three categories:

1. **Market pulse**—examples include daily sales numbers, market share, and subscriber turnover.
2. **Customer service**—examples include problems resolved on the first call, call center wait times, and on-time repair calls.
3. **Cost driver**—examples include number of repair trucks in the field, repair jobs completed per day, and call centre productivity.

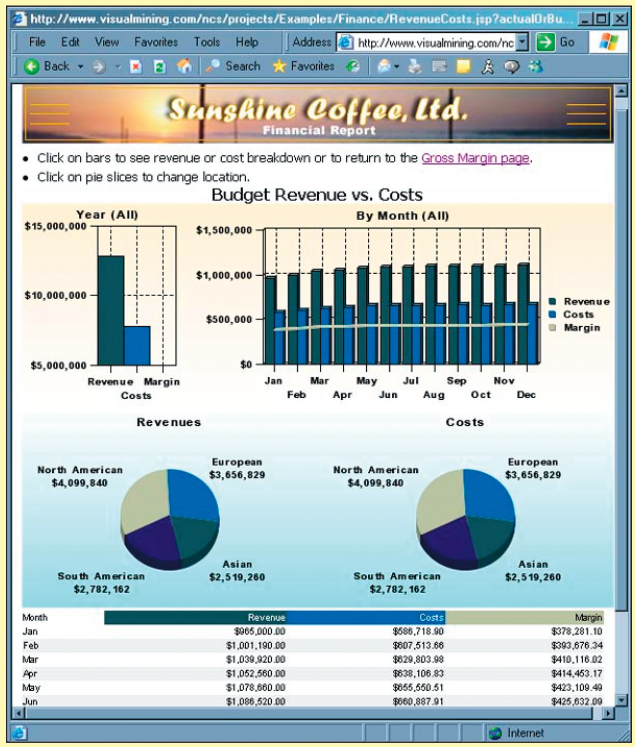


FIGURE 3.9

Visual Mining NetCharts Corporate Financial Dashboard

FIGURE 3.10

Visual Mining Sales Executive Dashboard

Kheradpir has memorized the screens and can tell at a glance when the lines on the charts are not trending as expected. The system informs him of events such as the percentage of customer calls resolved by voice systems, number of repair trucks in the field, and amount of time to resolve an IT system issue. The dashboard works the same way for 400 managers at every level of Verizon.[11]

Artificial Intelligence

Executive information systems are starting to take advantage of artificial intelligence to help executives make strategic decisions. RivalWatch offers a strategic business information service using artificial intelligence that enables organizations to track the product offerings, pricing policies, and promotions of online competitors. Clients can determine the competitors they want to watch and the specific information they wish to gather, ranging from products added, removed, or out of stock to price changes, coupons offered, and special shipping terms. Clients can check each competitor, category, and product either daily, weekly, monthly, or quarterly.

"Competing in the Internet arena is a whole different ballgame than doing business in the traditional brick-and-mortar world because you're competing with the whole world rather than the store down the block or a few miles away," said Phil Lumish, vice president of sales and marketing at RivalWatch.com. "With new products and campaigns being introduced at a breakneck pace, e-businesses need new tools to monitor the competitive environment, and our service is designed specifically to meet that need."[12]

Intelligent systems are various commercial applications of artificial intelligence. ***Artificial intelligence (AI)*** simulates human intelligence such as the ability to reason and learn. AI systems can learn or understand from experience, make sense of ambiguous or contradictory information, and even use reasoning to solve problems and make decisions effectively. AI systems can perform such tasks as boosting productivity in factories by monitoring equipment and signalling when preventive maintenance is required. The ultimate goal of AI is the ability to build a system that can mimic human intelligence. AI systems are beginning to show up everywhere:

- At Manchester Airport in England, the Hefner AI Robot Cleaner alerts passengers to security and nonsmoking rules while it scrubs up to 65,600 square feet of floor per day. Laser scanners and ultrasonic detectors keep it from colliding with passengers.
- Shell Oil's SmartPump keeps drivers in their cars on cold, wet winter days. It can service any automobile built after 1987 that has been fitted with a special gas cap and a windshield-mounted transponder that tells the robot where to insert the pump.
- Matsushita's courier robot navigates hospital hallways, delivering patient files, X-ray films, and medical supplies.

Examples of AI Systems

- The FireFighter AI Robot can extinguish flames at chemical plants and nuclear reactors with water, foam, powder, or inert gas. The robot puts distance between the human operator and the fire.[13]

AI systems dramatically increase the speed and consistency of decision making, solve problems with incomplete information, and resolve complicated issues that cannot be solved by conventional computing. There are many categories of AI systems; four of the most familiar are: (1) expert systems, (2) neural networks, (3) genetic algorithms, and (4) intelligent agents.

Expert Systems ***Expert systems*** are computerized advisory programs that imitate the reasoning processes of experts in solving difficult problems. Human expertise is transferred to the expert system, and users can access the expert system for specific advice. Most expert systems reflect expertise from many humans and can therefore perform better analysis than any single expert. Typically, the system includes a knowledge base containing various accumulated experience and a set of rules for applying the knowledge base to each particular situation. The best-known expert systems play chess and assist in medical diagnosis. Expert systems are the most commonly used form of AI in the business arena because they fill the gap when human experts are difficult to find, retain, or too expensive.

Neural Networks A ***neural network***, also called an ***artificial neural network***, is a category of AI that attempts to emulate the way the human brain works. The types of decisions for which neural networks are most useful are those that involve pattern or image recognition because a neural network can learn from the information it processes. Neural networks analyze large quantities of information to establish patterns and characteristics in situations where the logic or rules are unknown.

The finance industry is a veteran in neural network technology and has been relying on various forms of it for over two decades. The industry uses neural networks to review loan applications and create patterns or profiles of applications that fall into two categories: approved or denied. Other industries are following suit. For example, one neural network is being used by physicians at the Children's Hospital of Eastern Ontario to help keep watch over the progress of newborns. The hospital in collaboration with Carleton University has spent more than a decade developing a machine-intelligent system that can scour through reams of data looking for patterns. In this instance, vital signs and other medical information from babies are digitally recorded every few seconds and housed in one of the most complex medical databases in the country. Vital sign data from newborns with particular heart defects, body weights, and blood-pressures are analyzed by the neutral network to help predict valid patient outcomes in a reliable manner.[14]

Fuzzy logic is a mathematical method of handling imprecise or subjective information. The basic approach is to assign values between 0 and 1 to vague or ambiguous information. The higher the value, the closer it is to 1. The value zero is used to represent nonmembership, and the value one is used to represent membership. For example, fuzzy logic is used in washing machines that determine by themselves how much water to use or how long to wash (they continue washing until the water is clean). In accounting and finance, fuzzy logic allows people to analyze information with subjective financial values (intangibles such as goodwill) that are very important considerations in economic analysis. Fuzzy logic and neural networks are often combined to express complicated and subjective concepts in a form that makes it possible to simplify the problem and apply rules that are executed with a level of certainty.

Genetic Algorithms A ***genetic algorithm*** is an artificial intelligence system that mimics the evolutionary, survival-of-the-fittest process to generate increasingly better solutions to a problem. A genetic algorithm is essentially an optimizing system: It finds the combination of inputs that gives the best outputs.

Genetic algorithms are best suited to decision-making environments in which thousands, or perhaps millions, of solutions are possible. Genetic algorithms can find and evaluate solutions with many more possibilities, faster and more thoroughly than a human. Organizations face decision-making environments for all types of problems that require optimization techniques such as the following:

- Business executives use genetic algorithms to help them decide which combination of projects a firm should invest in, taking complicated tax considerations into account.
- Investment companies use genetic algorithms to help in trading decisions.
- Telecommunication companies use genetic algorithms to determine the optimal configuration of fibre-optic cable in a network that may include as many as 100,000 connection points. The genetic algorithm evaluates millions of cable configurations and selects the one that uses the least amount of cable.[15]

Intelligent Agents An ***intelligent agent*** is a special-purpose knowledge-based information system that accomplishes specific tasks on behalf of its users. Intelligent agents use their knowledge base to make decisions and accomplish tasks in a way that fulfills the intentions of a user. Intelligent agents usually have a graphical representation such as "Sherlock Holmes" for an information search agent.

One of the simplest examples of an intelligent agent is a shopping bot. A ***shopping bot*** is software that will search several retailer Web sites and provide a comparison of each retailer's offerings including price and availability. Increasingly, intelligent agents handle the majority of a company's Internet buying and selling and handle such processes as finding products, bargaining over prices, and executing transactions. Intelligent agents also have the capability to handle all supply chain buying and selling.

Another application for intelligent agents is in environmental scanning and competitive intelligence. For instance, an intelligent agent can learn the types of competitor information users want to track, continuously scan the Web for it, and alert users when a significant event occurs.

By 2010, some 4 million AI robots are expected to populate homes and businesses, performing everything from pumping gas to delivering mail. According to a new report by the United Nations and the International Federation of Robotics, more than half the AI robots will be toys and the other half will perform services. Bots will deactivate bombs, clean skyscraper windows, and vacuum homes.[16]

Data Mining

Wal-Mart consolidates point-of-sale details from its 3,000 stores and uses AI to transform the information into business intelligence. Data-mining systems sift instantly through the information to uncover patterns and relationships that would elude an army of human researchers. The results enable Wal-Mart to predict sales of every product at each store with uncanny accuracy, translating into huge savings in inventories and maximum payoff from promotional spending.

Data-mining software typically includes many forms of AI such as neural networks and expert systems. Data-mining tools apply algorithms to information sets to uncover inherent trends and patterns in the information, which analysts use to develop new business strategies. Analysts use the output from data-mining tools to build models that, when exposed to new information sets, perform a variety of data analysis functions. The analysts provide business solutions by putting together the analytical techniques and the business problem at hand, which often reveals important new correlations, patterns, and trends in information. A few of the more common forms of data-mining analysis capabilities include cluster analysis, association detection, and statistical analysis. Data mining is covered in detail in Chapter 7.

OPENING CASE QUESTIONS

Information Systems are Central at Grocery Gateway

1. What information systems are used at Grocery Gateway?
2. How do these systems improve organizational performance?
3. Identify a few key metrics a Grocery Gateway executive might want to monitor on a digital dashboard. How can these metrics be used to improve organizational decision making?

3.2 ENTERPRISE SYSTEMS

Trek, a leader in bicycle products and accessories, gained a 30-percent increase in market share by streamlining its information systems. The largest improvement realized from the new systems was the ability to obtain key management information to drive business decisions in line with the company's strategic goals. The system also included a highly successful Web site developed for the 1,400 Trek dealers where they could enter orders, check stock availability, view accounts receivable, and verify credit. Tonja Green, Trek channel manager for North America, stated, "We wanted to give our dealers an easier and quicker way to enter their orders and get information. Every week the number of Web orders increases by 25 to 30 percent due to the new system."[17]

The following sections in this chapter introduce supply chain management, customer relationship management, business process reengineering, and enterprise resource planning—enterprise systems organizations can use to make decisions and gain competitive advantages.

SUPPLY CHAIN MANAGEMENT

To understand a supply chain, consider a customer purchasing a Trek bike from a dealer. The supply chain begins when a customer places an order for a Trek bike with the dealer. The dealer purchases the bike from the manufacturer, Trek. Trek purchases the raw materials required to make the bike such as metal, packaging, and accessories from different suppliers. The supply chain for Trek encompasses every activity and party involved in the process of fulfilling the order from the customer for the new bike.

Supply chain management (SCM) involves the management of information flows between and among stages in a supply chain to maximize total supply chain effectiveness and profitability. The four basic components of supply chain management include:

1. **Supply chain strategy**—the strategy for managing all the resources required to meet customer demand for all products and services.
2. **Supply chain partners**—the partners chosen to deliver finished products, raw materials, and services including pricing, delivery, and payment processes along with partner relationship monitoring metrics.
3. **Supply chain operation**—the schedule for production activities including testing, packaging, and preparation for delivery. Measurements for this component include productivity and quality.
4. **Supply chain logistics**—the product delivery processes and elements including orders, warehouses, carriers, defective product returns, and invoicing.

Dozens of steps are required to achieve and carry out each of the above components. SCM software can enable an organization to generate efficiencies within these steps by automating and improving the information flows throughout and among the different supply chain components.

Wal-Mart and Procter & Gamble (P&G) implemented a successful SCM system, which linked Wal-Mart's distribution centres directly to P&G's manufacturing centres. Every time a Wal-Mart customer purchases a P&G product, the system sends a message directly to the factory alerting P&G to restock the product. The system also sends an automatic alert to P&G whenever a product is running low at one of Wal-Mart's distribution centres. This real-time information allows P&G to produce and deliver products to Wal-Mart without having to maintain large inventories in its warehouses. The SCM system saves time, reduces inventory, and decreases order-processing costs for P&G, which P&G passes on to Wal-Mart in the form of discounted prices.[18]

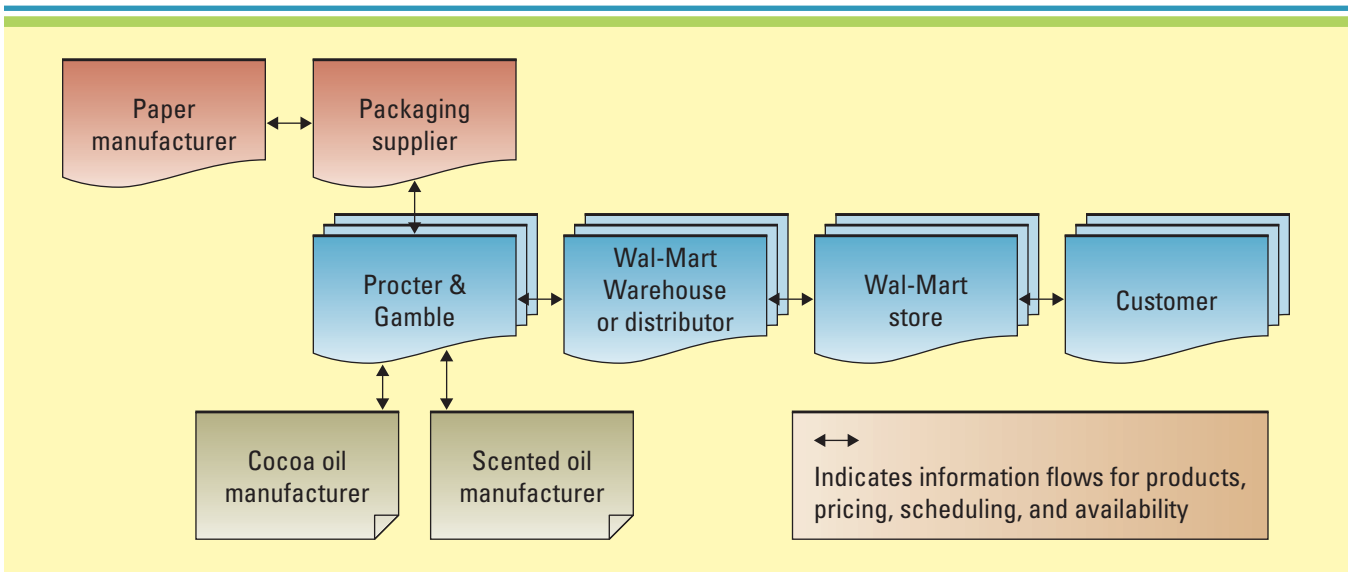
Figure 3.11 diagrams the stages of the SCM system for a customer purchasing a product from Wal-Mart. The diagram demonstrates how the supply chain is dynamic and involves the constant flow of information between the different parties. For example, a customer purchases a product from Wal-Mart and generates order information. Wal-Mart supplies the order information to its warehouse or distributor. The warehouse or distributor transfers the order information to the manufacturer, who provides pricing and availability information to the store and replenishes the product. Partners transfer all payments electronically.

Effective and efficient supply chain management systems can enable an organization to:

- Decrease the power of its buyers.
- Increase its own supplier power.
- Increase switching costs to reduce the threat of substitute products or services.
- Create entry barriers thereby reducing the threat of new entrants.
- Increase efficiencies while seeking a competitive advantage through cost leadership (see Figure 3.12).

FIGURE 3.11

Supply Chain for a Product Purchased from Wal-Mart



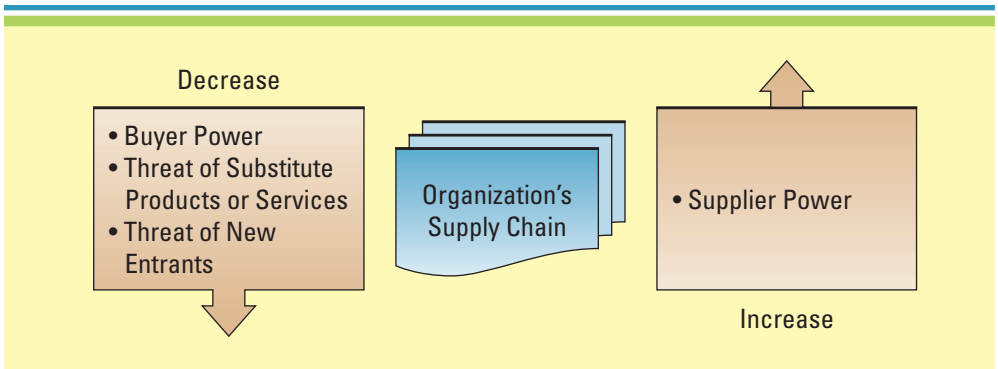


FIGURE 3.12
Effective and Efficient Supply Chain Management's Effect on Porter's Five Forces

CUSTOMER RELATIONSHIP MANAGEMENT

Today, most competitors are simply a mouse-click away. The intense competition in today's marketplace forces organizations to switch from sales-focused strategies to customer-focused strategies.

Charles Schwab recouped the cost of a multimillion-dollar customer relationship management system in less than two years. The system, developed by Siebel, allows the brokerage firm to trace each interaction with a customer or prospective customer and then provide services (retirement planning, for instance) to each customer's needs and interests. The system provides Schwab with a complete view of its customers, which it uses to differentiate serious investors from nonserious investors. For example, automated deposits from paycheques are a sign of a serious investor, while stagnant balances signal a nonserious investor. Once Schwab is able to make this determination, the firm allocates its resources accordingly, saving money by not investing time or resources in subsidizing nonserious investors.[19]

Customer relationship management (CRM) involves managing all aspects of a customer's relationship with an organization to increase customer loyalty and retention and an organization's profitability. CRM allows an organization to gain insights into customers' shopping and buying behaviours. Kaiser Permanente, the United States' largest non-profit health plan provider, undertook a CRM strategy to improve and prolong the lives of diabetics. After compiling CRM information on 84,000 diabetic patients, Kaiser found that only 20 percent were getting their eyes checked routinely. (Diabetes is the leading cause of blindness.) As a result, Kaiser is now enforcing rigorous eye-screening programs for diabetics, along with creating support groups for obesity and stress (two more factors that make diabetes even worse). This CRM-based "preventive medicine" approach is saving Kaiser money and, more importantly, improving the health of diabetic patients.[20]

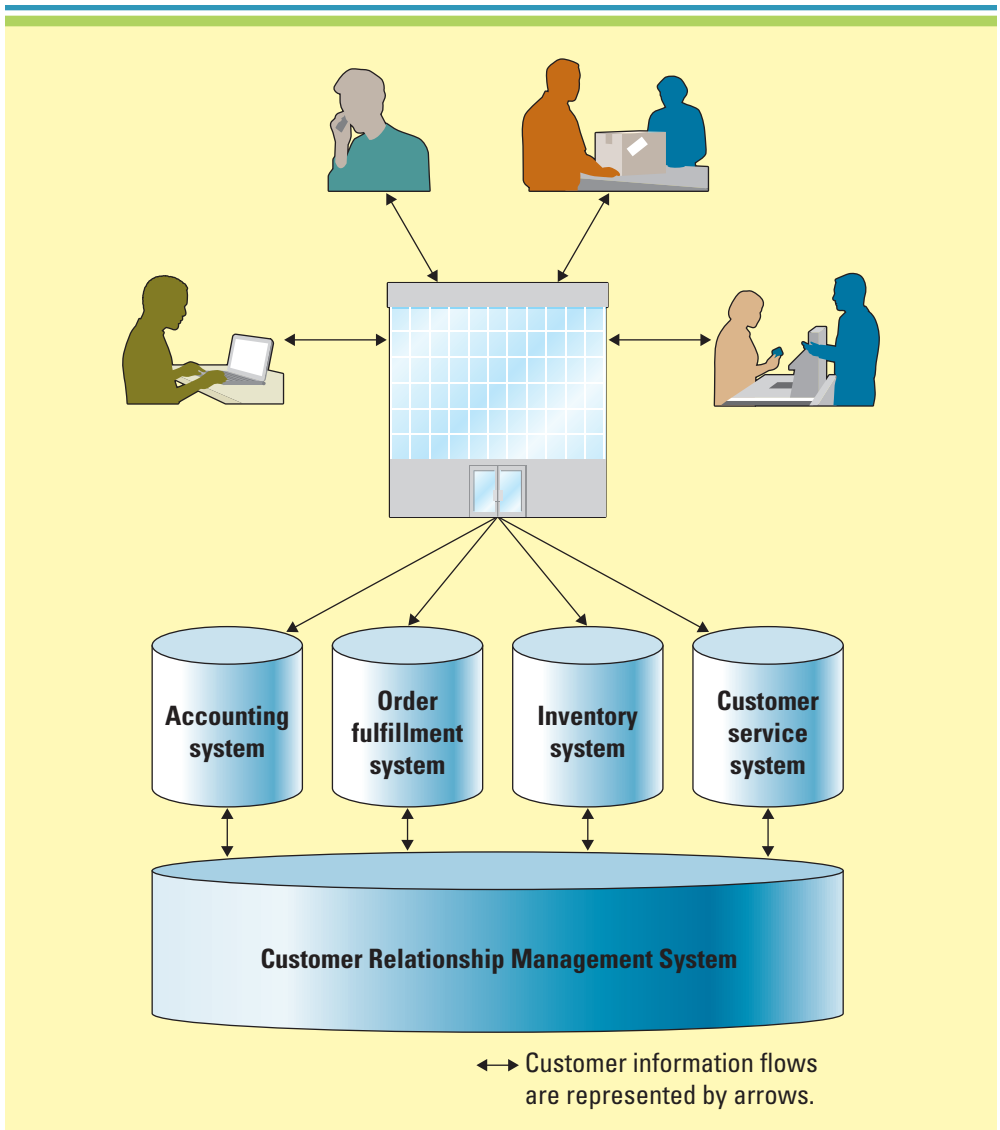
Figure 3.13 provides an overview of a typical CRM system. Customers contact an organization through various means including call centres, Web access, e-mail, faxes, and direct sales. A single customer may access an organization multiple times through many different channels. The CRM system tracks every communication between the customer and the organization and provides access to CRM information across different systems from accounting to order fulfillment. Understanding all customer communications allows the organization to communicate effectively with each customer. It gives the organization a detailed understanding of each customer's products and services regardless of the customer's preferred communication channel. A customer service representative can easily view detailed account information and history through a CRM system when providing information to a customer such as expected delivery dates, complementary product information, and customer payment and billing information.

CRM Strategy

Eddie Bauer ships 110 million catalogues a year, maintains two Web sites, and has more than 600 retail stores. The company collects information through customer transactions and analyzes the information to determine the best way to

FIGURE 3.13

Customer Relationship Management Overview



market to each individual customer. Eddie Bauer discovered that customers who shop across all three of its distribution channels—catalogues, Web sites, and stores—spend up to five times more than customers who shop through only one channel.

Michael Boyd, director of CRM at Eddie Bauer, stated, "Our experience tells us that CRM is in no way, shape, or form a software application. Fundamentally, it is a business strategy to try to optimize profitability, revenue, and satisfaction at an individual customer level. Everything in an organization, every single process, every single application, is a tool that can be used to serve the CRM goal."[21]

It is important to realize that CRM is not just a technology, but also a strategy that an organization must embrace on an enterprise level. Although there are many technical components of CRM, it is actually a process and business goal simply enhanced by technology. Implementing a CRM system can help an organization identify customers and design specific marketing campaigns tailored to each customer, thereby increasing customer spending. A CRM system also allows an organization to treat customers as individuals, gaining important insights into their buying preferences and behaviours and leading to increased sales, greater profitability, and higher rates of customer loyalty.

BUSINESS PROCESS REENGINEERING

A ***business process*** is a standardized set of activities that accomplish a specific task, such as processing a customer's order. ***Business process reengineering (BPR)*** is the analysis and redesign of workflow within and between enterprises. The concept of BPR traces its origins to management theories developed as early as the 19th century. The purpose of BPR is to make all business processes best-in-class. Frederick Taylor suggested in the 1880s that managers could discover the best processes for performing work and reengineer the process to optimize productivity. BPR echoes the classical belief that there is one best way to conduct tasks. In Taylor's time, technology did not allow large companies to design processes in a cross-functional or cross-departmental manner. Specialization was the state-of-the-art method to improve efficiency given the technology of the time.[22]

BPR reached its heyday in the early 1990s when Michael Hammer and James Champy published their best-selling book, *Reengineering the Corporation*. The authors promoted the idea that radical redesign and reorganization of an enterprise (wiping the slate clean) sometimes was necessary to lower costs and increase quality of service and that information technology was the key enabler for that radical change. Hammer and Champy believed that workflow design in most large corporations was based on invalid assumptions about technology, people, and organizational goals. They suggested seven principles of reengineering to streamline the work process and thereby achieve significant improvement in quality, time management, and cost (see Figure 3.14).[23]

Finding Opportunity Using BPR

Companies frequently strive to improve their business processes by performing tasks faster, cheaper, and better. Figure 3.15 displays different ways to travel the same road. A company could improve the way that it travels the road by moving from foot to horse and then from horse to car. However, true BPR would look at taking a different path. A company could forget about travelling on the same old road and use an airplane to get to its final destination. Companies often follow the same indirect path for doing business, not realizing there might be a different, faster, and more direct way of doing business.

Creating value for the customer is the leading factor for instituting BPR, and information technology often plays an important enabling role. Radical and fundamentally new business processes enabled Progressive Insurance to slash the claims settlement from 31 days to four hours. Typically, car insurance companies follow this standard claims resolution process: The customer gets into an accident, has the car towed, and finds a ride home. The customer then calls the insurance company to begin the claims process, which usually takes over a month (see Figure 3.16).[24]

Seven Principles of Business Process Reengineering
1. Organize around outcomes, not tasks.
2. Identify all the organization's processes and prioritize them in order of redesign urgency.
3. Integrate information processing work into the real work that produces the information.
4. Treat geographically dispersed resources as though they were centralized.
5. Link parallel activities in the workflow instead of just integrating their results.
6. Put the decision point where the work is performed, and build control into the process.
7. Capture information once and at the source.

FIGURE 3.14
Seven Principles of Business Process Reengineering

FIGURE 3.15

Better, Faster, Cheaper, or BPR

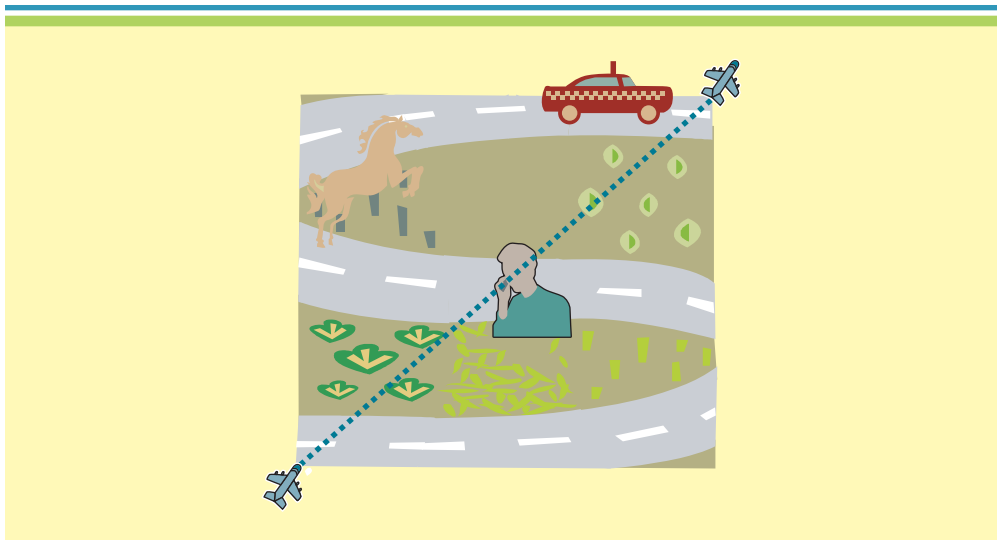
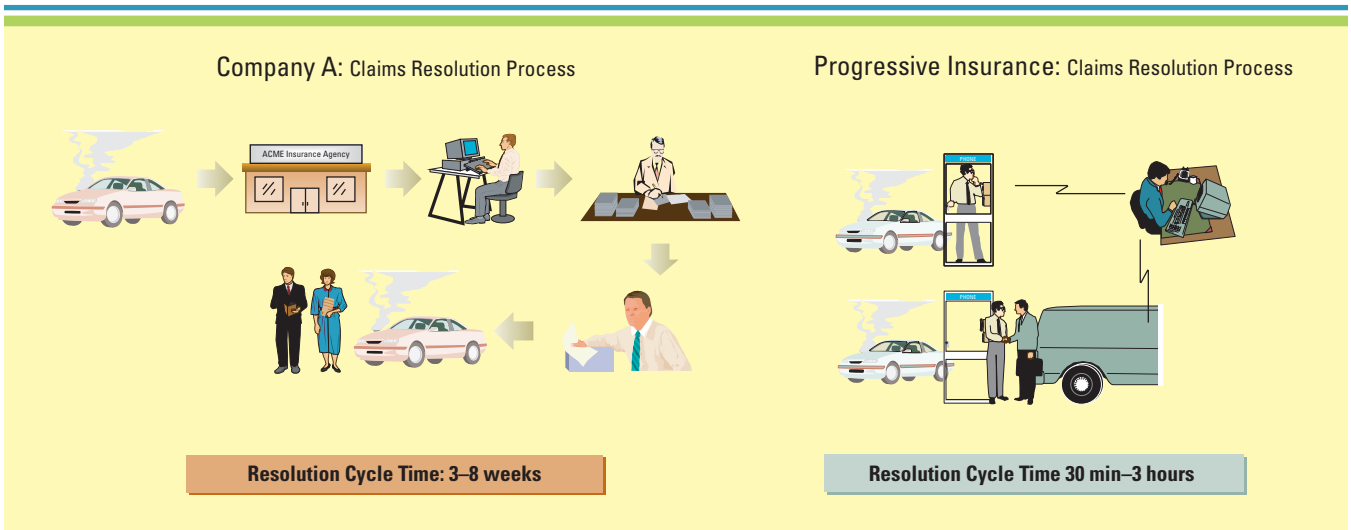


FIGURE 3.16

Auto Insurance Claims Processes



Progressive Insurance improved service to its customers by offering a mobile claims process. When a customer has a car accident, he or she calls in the claim on the spot. The Progressive claims adjuster comes to the accident and performs a mobile claims process, surveying the scene and taking digital photographs. The adjuster then offers the customer on-site payment, towing services, and a ride home. (see Figure 3.16).[25]

A true BPR effort does more for a company than simply improve it by performing a process better, faster, and cheaper. Progressive Insurance's BPR effort redefined best practices for its entire industry. Figure 3.17 displays the different types of change an organization can achieve, along with the magnitude of change and the potential business benefit.

Pitfalls of BPR

One hazard of BPR is that the company becomes so wrapped up in fighting its own demons that it fails to keep up with its competitors in offering new products or services. While American Express tackled a comprehensive reengineering of its credit card business, MasterCard and Visa introduced a new product—the corporate

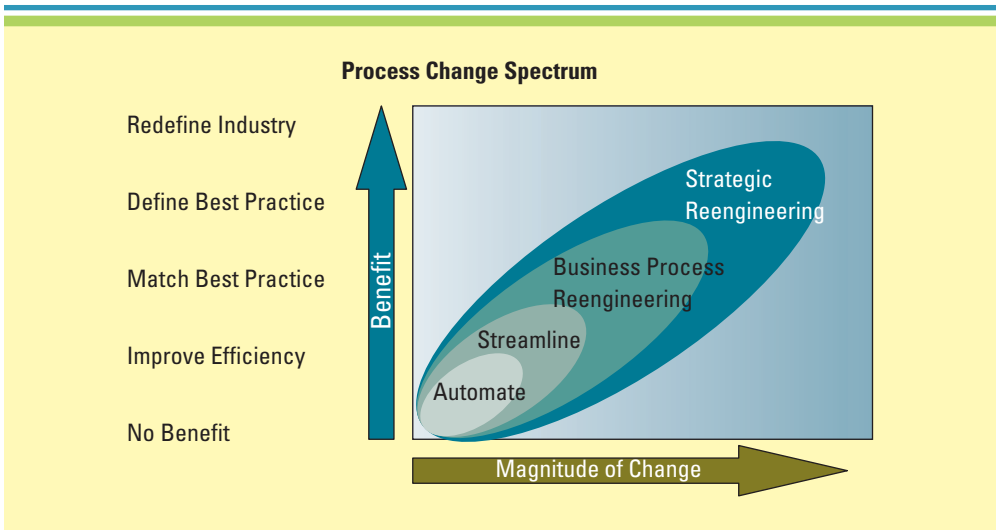


FIGURE 3.17
Process Change Spectrum

procurement card. American Express lagged a full year behind before offering its customers the same service.[26]

ENTERPRISE RESOURCE PLANNING

Many organizations fail to maintain consistency across business operations. If a single department, such as sales, decides to implement a new system without considering the other departments, inconsistencies can occur throughout the company. Not all applications are built to talk to each other, and if the sales function suddenly implements a new system that marketing and production cannot use or is inconsistent in the way it handles information, the company's operations become isolated.

Enterprise resource planning systems provide organizations with consistency. ***Enterprise resource planning (ERP)*** integrates all departments and functions throughout an organization into a single IT system (or integrated set of IT systems) so that employees can make decisions by viewing enterprisewide information on all business operations. An ERP system provides a method for effective planning and controlling of all the resources required to take, make, ship, and account for customer orders in a manufacturing, distribution, or service organization. The key word in enterprise resource planning is *enterprise*.

Coventry Connections, an Ottawa-based taxi cab company, operates a data-dispatch call centre for seven taxi fleets in the Ottawa, Gloucester, Oshawa, Kanata, and Nepean areas. To use the data-dispatch system, cab drivers pay Coventry a fee for maintenance, insurance, and equipment rentals; in turn, Conventry pays the drivers for the taxi chits they collect. A "taxi chit" is a slip of paper or small card issued by an employer to employees that taxi drivers would take as payment. Companies issue taxi chits in cases where employees need to get home safely having worked late into the evening or after celebrating at a company party or event. Conventry needs to collect these taxi chits in order to bill its corporate clients for the cost of the taxi chits.

Conventry uses SIA's Common Sense ERP system to facilitate its financial management processes, particularly around taxi chit processing. The system is built on IBM's WebSphere technology and utilizes an IBM iSeries server to support a GUI version of Common Sense. A cashiering application resides on the ERP system and is integrated with the ERP system's financial management tools. With the implementation of the ERP system, Conventry is in a position to introduce credit and debit account cards, as well as prepaid cards, to its corporate clients, thus eliminating the need for paper taxi chits. Bear in mind that processing paper taxi chits is a very manual process that can take as long as 45 days to collect money from clients. As chits come in they need to be sorted by customer, invoices need to be prepared and sent out, and payments need to be received. The ERP system not only allows Conventry to automate their system, and streamline their cash flow, the system allows the

company to expand their traditional customer base for taxi chits beyond corporate clients. For example, with the use of pre-paid cards, parents who are worried about their children drinking and driving could buy such cards for their kids. These parents could even recharge these cards over the phone by credit card, if they wanted.[27]

ERP Software

The many ERP vendors on the market today each offer different ERP solutions, but the core functions are the same, focusing on financial, accounting, sales, marketing, human resources, operations, and logistics. Vendors differentiate themselves by offering distinct functionality such as CRM and SCM systems.

But many customers find that their chosen ERP solution does not meet expectations. Despite many improvements in the software, failed ERP implementations are still far too common. According to Gartner Inc., the average failure rate for an ERP project is 66 percent. With those results, it is no wonder that some organizations view ERP as a necessary, strategic evil. The key word here though is *necessary*.

Many companies strive to make good financial decisions by making smart investments. The best way to ensure a good investment in ERP is to understand why failure occurs and how to avoid it. The first challenge is that ERP comes in many flavours. Its main purpose is to provide support and automation to a business process. The business world has many different business models with many ERP products available that serve them.

Finding the Right ERP Solution

A good ERP system will be highly reflective of the business process in place at the company. This means the software must perform many different tasks and that makes it complex. Most companies do not carry a high degree of ERP software expertise on their staff, making it easy to choose the wrong package. The key to making an effective purchase is to have solid business processes. Successful ERP projects share three basic attributes:

1. Overall fit
2. Proper business analysis
3. Solid implementation plans[28]

Overall Fit This refers to the degree of gaps that exist between the system and the business process. A well-fitting ERP has no major process gaps and very few minor ones. Think of a new ERP system as a suit. Typically, a customer buys a suit three ways: off the rack, off the rack and tailored to fit, or custom-made.

The way the solution fits the business process will normally determine the client's satisfaction level. Buying ERP off the rack is the equivalent of buying a canned software package. It fits some well, but not all. The customer can tailor the software so that its processes better line up with company processes. This is a good strategy provided the chosen package supports this. The downside is that it can get very expensive. Choosing a custom system can provide a great fit, but the company must thoroughly understand what it is doing and be able to support the associated financial burden.

Proper Business Analysis The best way to determine which fit strategy is right is to conduct a thorough business analysis. Successful companies normally spend up to 10 percent of the project budget on a business analysis. A proper analysis must result in a documented list of the business processes at work within the company. This will provide a basic tool that can measure vendor capability.

Solid Implementation Plans As with the installation of any successful process or machinery, a plan is needed to monitor the quality objectives and timelines. The plan will also employ processes such as workflow analysis and job combination to harvest savings.

A thorough implementation will transfer knowledge to system users. When the project is complete, employees must be capable of using the tools the new system provides. The users must also know what to do in cases when the process fluctuates. Most failed systems result from low-quality implementation. ERP is simply a tool. Tools that people do not know how to use can be as useless as having no tools at all.

INTEGRATING BUSINESS INFORMATION SYSTEMS

The above descriptions in this chapter have introduced you to various types of business information systems that exist across the enterprise such as supply chain management, customer relationship management, and enterprise resource planning. These are described in more detail in Chapters 4, 5, and 6. Though each is treated separately in different chapters, you should realize that these systems need to be tightly integrated in order to achieve maximum benefits in helping an organization achieve its goals and objectives. However, this is not always easy to do.

The challenge of integrating business information systems is that historically information systems were developed in organizations in a haphazard manner. Sadly, it was quite common for different departments in the same organization to deploy different hardware and software technologies that were not compatible or did not allow easy sharing of data between systems. Even when hardware and software components did match, often the description of basic data elements used in a company, such as customer name and address information, were defined differently in different systems thus preventing easy sharing of basic transactional data across the firm. Sometimes, the same transactional information would have to be re-entered manually across various systems to facilitate data exchange. All these incompatibilities resulted in long time delays and the introduction of erroneous data into business information systems creating reconciliation nightmares for people trying to fix things later on. (More details about the importance of integrating data across the enterprise and how to deploy and foster integrated business information systems through sound systems development and project management techniques are discussed in Chapter 10.)

Given this history, organizations have been working hard to deliver business information systems that work together smoothly and efficiently as possible. One reason for this is that organizations now recognize that tightly integrated business information systems lead to improved organizational decision making. Without this tight integration, wrong or contradictory information is fed into higher-level decision-making systems by various transaction-based systems, leading to potentially poor decision making.

So, though it is easier to build a business information system as a stand-alone entity, in the long run it is counter-productive. Smart organizations recognize the need to tightly integrate their business information systems as a means to facilitate proper decision making, as well as to achieve efficiency gains and competitive advantage.

OPENING CASE QUESTIONS

Information Systems are Central at Grocery Gateway

4. What features of a CRM system could Grocery Gateway deploy to increase customer loyalty and retention?
5. Describe how Cube Route's logistics management software improved Grocery Gateway's supply chain performance.
6. Comment on the need for integration between the various types of information systems at Grocery Gateway. What benefits from integration do you see? What challenges do you think will exist in facilitating such integration?

SUMMARY OF KEY THEMES

The purpose of this chapter was to:

- provide a description of decision-making information systems,
- give an overview of the various business information systems used across the enterprise,
- explain the concept of decision making,
- showcase the differences between TPS, DSS, and EIS, and
- introduce the specific business information systems of SCM, CRM, BPR, and ERP.

The goal of providing you with this information was to provide you, the business student, with knowledge of the types of information systems that exist in an organization. By doing so, you should now have a better understanding of:

- how these systems can improve organizational performance and decision making, and
- the importance of integrating these various systems together.

KEY TERMS

Analytical information 76
Artificial intelligence 82
Business intelligence 77
Business process 89
Business process reengineering (BPR) 89
Consolidation 79
Customer relationship management (CRM) 87
Decision support system (DSS) 77
Digital dashboard 79
Drill-down 79
Enterprise resource planning (ERP) 91
Executive information system (EIS) 78
Expert system 83
Fuzzy logic 83
Genetic algorithm 83
Goal-seeking analysis 78
Intelligent agent 84
Intelligent system 82
Model 75
Neural network (artificial neural network) 83
Online analytical processing (OLAP) 77
Online transaction processing (OLTP) 76
Sensitivity analysis 77
Shopping bot 84
Slice-and-dice 79
Supply chain management (SCM) 85
Transaction processing system (TPS) 76
Transactional information 76
What-if analysis 77

CLOSING CASE ONE

Consolidating Touchpoints for Saab

This case illustrates the use of a CRM system in an organization.

Saab Cars USA imports more than 37,000 Saab sedans, convertibles, and wagons annually and distributes the cars to 220 U.S. dealerships. Saab competes in the premium automotive market, and its primary rivals attract customers through aggressive marketing campaigns, reduced prices, and inexpensive financing. Saab decided that the answer to beating its competition was not to spend capital on additional advertising, but to invest in Siebel Automotive, a customer relationship management system.

Until recently, the company communicated with its customers through three primary channels: (1) dealer network, (2) customer assistance centre, (3) lead management centre. Traditionally, each channel maintained its own customer database, and this splintered approach to managing customer information caused numerous problems for the company. For example, a prospective customer might receive a direct-mail piece from Saab one week, then an e-mail

with an unrelated offer from a third-party marketing vendor the next week. The local dealer might not know of either activity, and therefore might deliver an ineffective pitch when the customer visited the showroom that weekend. Al Fontova, direct marketing manager with Saab Cars USA, stated he had over 3 million customer records and 55 files at three different vendors. Analyzing this information in aggregate was complicated, inefficient, and costly.

Saab required a solution that would provide a consolidated customer view from all three touchpoints. In 2003, Saab implemented the Siebel CRM solution, which provides Saab's call centre employees with a 360-degree view of each customer, including prior service-related questions and all the marketing communications they have received. Known internally as "TouchPoint," the Siebel application provides Saab's dealers with a powerful Web-based solution for coordinating sales and marketing activities. These tracking capabilities enable Saab to measure the sales results of specific leads, recommend more efficient selling techniques, and target its leads more precisely in the future. Using Siebel Automotive, Saab received the following benefits:

- Direct marketing costs decreased by 5 percent.
- Lead follow-up increased from 38 percent to 50 percent.
- Customer satisfaction increased from 69 percent to 75 percent.
- Saab gained a single view of its customers across multiple channels.29

Questions

1. How has implementing a CRM system enabled Saab to gain a competitive advantage?
2. Estimate the potential impact to Saab's business if it had not implemented a CRM system.
3. What additional benefits could Saab receive from implementing a supply chain management system?
4. Model Saab's supply chain.
5. How is Saab's CRM implementation going to influence its SCM practices?

CLOSING CASE TWO

Made-to-Order Businesses

This case illustrates the powerful impact enterprise systems have in helping organizations implement business strategies like mass customization.

In the past, customers had two choices for purchasing products: (1) purchase a mass-produced product like a pair of jeans or a candy bar or (2) commission a custom-made item that was perfect but cost a small fortune. Mass customization is a new trend in the retail business. Mass customization hits that sweet spot between harnessing the cost efficiencies of mass production and offering so many options that customers feel the product has been designed just for them. Today, many companies are using strategic information systems to implement mass customization business strategies.

Lands' End

Lands' End built a decision support system that could pinpoint a person's body size by taking just a few measurements and running a series of algorithms. The process begins when the customer answers questions on Lands' End's Web site about everything from waist size to inseam. Lands' End saves the data in its customer relationship management system, which is used for reorders, promotions, and marketing campaigns. The order is then sent to San Francisco where supply chain management software determines which one of five contracted manufacturers should receive the order. The chosen manufacturer then cuts and sews the material and ships the finished garment directly to the customer.

Over 40 percent of Lands' End shoppers prefer a customized garment to the standard-sized equivalent, even though each customized garment costs at least $23 more and takes four weeks to deliver. Customized clothes account for a growing percentage of Lands' End's $593 million online business. Reorder rates for Lands' End custom-clothing buyers are 34 percent higher than for buyers of its standard-sized clothing.

Nike

The original business model for Nike iD concentrated on connecting with consumers and creating customer loyalty. Nike iD's Web site allows customers to build their own running shoes. The process begins when customers choose from one of seven different styles and orders from numerous colour combinations. Dark-pink bottoms, red mesh, bright yellowing lining, purple laces, blue swoosh, and a eucalyptus green accent. Customers can even place eight-character personalized messages on the side. The cost averages about $35 more than buying the regular shoes in a store.

Once Nike receives the custom order, its supply chain management system sends it to one of 15 plants depending on production availability. Customers receive their shoes within four weeks. The program experienced triple-digit growth in just two years.

Stamps.com

Stamps.com made an agreement with the U.S. Postal Service to sell customized stamps. Customers could put pictures of their choice on an actual U.S. postage stamp. Pictures ranged from dogs to fiancées. The response was phenomenal: Within seven weeks Stamps.com processed and sold more than 2 million PhotoStamps at US$1 for a first-class stamp.

Thinking about mass customization as a goal changes the way businesses think about their customers. Using supply chain management and customer relationship management to implement mass customization can have a direct impact on a business's bottom line.[30]

Questions

1. What role does supply chain management and customer relationship management play in a mass customization business strategy?
2. How can Lands' End use its CRM system to improve its business?
3. How can Nike use a CRM system to improve its customer relations?
4. Why is Nike's supply chain management system critical to its Nike iD order fulfillment process?
5. Choose one of the examples above and explain how an ERP system could help facilitate the mass customization effort.
6. Choose one of the examples above and explain how the company is attempting to gain a competitive advantage with mass customization.
7. Identify one other business that could benefit from the use of mass customization. Explain why this business would need customer relationship management and supply chain management systems to implement a mass customization business strategy.

CLOSING CASE THREE

Information Systems Are Critical For Take-Off in Canada's Airline Industry

This case highlights the critical role information systems play in running the enterprise.

When asked about the Canadian airline industry's reliance on information systems, Stephen Smith sits up tall. As a seasoned airline executive with over 25 years experience working for

airlines such as Air Canada, Zip Air, WestJet, Air Ontario, and Air Toronto, Stephen knows that the airline industry has long been an intensive user of information technology—a direct result of airlines like Air Canada who carry over 20 million passengers every year, on 200,000 flights. "In the old days, the inventory system to maintain passenger records and numbers booked on a flight, were done on paper, and hung on nails. While this system worked, it certainly wouldn't work in a day and age like today. Computerized information systems are essential."

Think about it. From a process perspective, each flight must be allocated an aircraft, with 'x' number of economy seats and 'y' number of executive class seats. Then, against that inventory, names, record locators and payment information must be matched to generate a ticket. That ticket must be then turned over to a gate agent, who then forwards it to the revenue accounting office, who then takes the money into revenue, as at this point, the revenue is earned.

When questioned about how airlines go about maximizing the revenue generated on every flight, Stephen explains how airlines rely heavily on the use of revenue management information systems. "Airlines, including Air Canada, invest heavily in revenue management systems. These systems forecast the demand for a flight at various fare levels based on historical demand. Without computers, this task would be next to impossible."

The reason for this is simply the proliferation of data involved. For a large airline carrier having hundreds of routes and multiple fare classes, the mathematical modelling required is beyond that of a human being. As a result, airlines invest millions of dollars into building and maintaining their revenue management systems in order to handle the vast amounts of data that must be processed. With hundreds or thousands of departures per day, the need for quick and accurate revenue management systems is critical for airlines in terms of helping them figure out what inventory to sell given the demand for flights and forecasts.

In fact, the need to manage revenue has become critical ever since deregulation of the airline industry in Canada has occurred. Since deregulation, carriers have been free to set their own airfares, and rather than trying to fill planes, airlines now try to maximize their revenue. Thus the emphasis for airlines these days is to fill planes with enough high-paying customers to cover costs and make a profit, as opposed to ensuring that all flights are simply full.[31]

What are revenue management systems? These are information systems used by airlines to calculate how many seats in each fare class are offered on particular legs of a flight at a given time taking into account current demand, historical data, and special one-time events that influence demands for travel. According to Mr. Smith, "the process of revenue management is a very, very sophisticated form of revenue control, which, based on historical booking trends, attempts to forecast the passenger demand for a flight, and what they might be willing to pay. The ideal scenario is that a passenger shows up at the last minute, there is one open seat on the flight, and they are willing to pay the amount the airline is asking for that last seat."

With the advent of the Web, airlines are well aware that customers are increasingly able to compare fares from all competitors with a few mouse clicks. An airline's fares have become almost totally visible and thus airlines are forced to implement competitive fares in their revenue management systems. If a fare is too high, a potential customer will buy from the competition; if a fare is too low, the airline loses out on potential revenue earned.[32]

These revenue management systems also need to set overbooking levels. Stephen Smith explains, "some people simply do not show up for their designated flights. Approximately 10% of passengers do not show up. These no-shows force airlines to overbook their flights, otherwise, 10% of an airline's revenue would not be realized— which means that for most airlines, they would become very unprofitable, very quickly."

Further, when taking into account cancelled flights, people changing bookings, delays, and re-bookings, the logic built into revenue management systems becomes very complicated, very fast. This complexity is exacerbated when one considers the fact that revenue systems must also deal with different fare structures for different types of passengers. In general, there are two types of passengers: those who must fly on that flight, on that day; and those who are willing to move flights, days, and even destinations. An example of the former are business travellers or those with medical appointments. An example of the latter are those on vacation, or going to meet friends and relatives. Obviously, those in the first group are far more willing to pay

more for their flight, as the convenience of a flight on that day to their destination at that time is far more important than the cost of the flight. The second group are far more likely to gravitate to the cheapest flight, regardless of when it leaves (within reason) either by day or time; in fact, vacation travellers will even change countries based upon which flight is the cheapest. In addition, the first group (business travellers and those with medical appointments) normally books their flights much closer to flight time, as planning travel a month ahead for most businesses is not normal; this group rarely stays over weekends and wants to be able to change flights if plans change (which they frequently do). The second group, is completely different, planning much further ahead, staying over weekends, and rarely changing their plans.

As a result, airlines came up with various fare levels, and various requirements to obtain those fares. And revenue management must handle these requirements. The first fare was the "full fare economy fare," which was the most one could pay for an economy seat, but could be bought up to the last minute, and allowed the traveller to change flights without a penalty. Then there were 3-day advance fares, 7-day advance fares, and 14-day advance fares, each with a number of fares in each, allowing the traveller to change/not change/pay for a change as well as the requirement to stay over a Saturday night, or not. You can imagine doing this inventory for each flight, for 660 flights per day, for 365 days (most airlines only keep inventory of flights up to one year in advance) would be impossible without the help of computerized information systems.

To handle these different fare scenarios, the airlines set up fare "buckets" and "nest" them within broad groups, so that it allowed, for instance, a 3-day fare (normally more than a 7-day fare) to outsell its bucket, if there were 7-day fares still remaining. Once a flight booking goes above the expected higher booking rate, the lower fare inventory is shut down, as the flight is booking up faster than expected. Conversely, if the booking levels go below and expected lower booking rate, then the lower fares are opened up, as the flight is booking slower than expected. This analysis is done on every flight for every day for the entire year, every hour, as otherwise airlines could be caught flat footed, and oversell, or undersell a large number of flights for the entire year.

This sophistication is now being taken to the next level, as passengers who are the airlines' most loyal (for example, in Air Canada, Elite or Super Elite passengers) now have the ability to book a flight, even if it has been overbooked, or a certain fare group is sold out. This allows the airline to repay its most loyal customers with something not available to all customers.

In the future, airlines hope to be able to set up a fare schedule for each customer, depending on their buying habits, and loyalty to the airline. This is just another attempt, in a fixed cost industry, to buy loyalty, as almost every dollar of revenue drops to the bottom line of the airline, and the more a customer flies the airline, the more revenue they generate. A case in point is Air Canada's decision to implement a data warehouse to enhance Air Canada's yield marketing intelligence and provide the company with a scalable platform that facilitates future growth in CRM and finance analytics applications.[33]

In addition to revenue management, revenue accounting for an airline is also critical, as revenue cannot be taken into account until the customer has flown. This is another area where, since the demise of paper tickets (the vast majority of travel is now ticketless), computer systems must be able to match the customer with the fare that has been paid, to ensure they have followed the appropriate rules, and to take that fare into revenue.

Stephen Smith relaxes back in his chair and summarizes his thoughts on the airline industry's reliance on information systems, "As you can imagine, the ability to forecast passenger demand for a flight, at all different fare levels, is a very sophisticated process which was never considered back in the days that people counted tags for their flight inventory. For this reason, I can ensure you that information systems have become fundamentally critical to the daily operations of an airline. There's no turning back to paper now."

Questions

1. What advantages are there for an airline to use a revenue management system?
2. Are revenue management systems a competitive advantage or simply a new necessity for doing business in the airline industry today?

3. What other industries could benefit from the use of a revenue management system?
4. How could an airline use customer information to gain competitive advantage?
5. What types of metrics would airline executive want to see in a digital dashboard?
6. How would an airline's revenue management system be used for decision support?

MAKING BUSINESS DECISIONS

1. Making decisions

You are the vice president of human resources for a large consulting company. You are compiling a list of questions that you want each interviewee to answer. The first question on your list is, "How can information technology enhance your ability to make decisions at our organization?" Prepare a one-page report to answer this difficult question.

2. DSS and EIS

Dr. Rosen runs a large dental conglomerate—Teeth Doctors—that staffs more than 700 dentists in four provinces. Dr. Rosen is interested in purchasing a competitor called Dentix that has 150 dentists in three additional provinces. Before deciding whether to purchase Dentix, Dr. Rosen must consider several issues:

- The cost of purchasing Dentix.
- The location of the Dentix offices.
- The current number of customers per dentist, per office, and per province.
- The merger between the two companies.
- The professional reputation of Dentix.
- Other competitors.

Explain how Dr. Rosen and Teeth Doctors can benefit from the use of information systems to make an accurate business decision in regard to the potential purchase of Dentix.

3. SCM, CRM, and ERP

Jamie Ash is interested in applying for a job at a large software vendor. One of the criteria for the job is a detailed understanding of strategic initiatives such as SCM, CRM, and ERP. Jamie has no knowledge of any of these initiatives and cannot even explain what the acronyms mean. Jamie has come to you for help. She would like you to compile a summary of the three initiatives, including an analysis of how the three are similar and how they are different. Jamie would also like to perform some self-training via the Web so be sure to provide her with several additional links to key Web sites that offer detailed overviews on SCM, CRM, and ERP.

4. Finding information on decision support systems

You are working on the sales team for a small catering company that maintains 75 employees and generates $1 million in revenues per year. The owner, Pam Hetz, wants to understand how she can use decision support systems to help grow her business. Pam has an initial understanding of DSS systems and is interested in learning more about what types are available, how they can be used in a small business, and the cost associated with different DSS systems. In a group, research the Web site www.dssresources.com and compile a presentation that discusses DSS systems in detail. Be sure to answer all Pam's questions on DSS systems in the presentation.

5. Gaining business intelligence from strategic initiatives

You are a new employee in the customer service department at Premier One, a large pet food distributor. The company, founded by several veterinarians, has been in business for

three years and focuses on providing nutritious pet food at a low cost. The company currently has 90 employees and operates in seven provinces. Sales over the past three years have tripled, and the manual systems currently in place are no longer sufficient to run the business. Your first task is to meet with your new team and create a presentation for the president and CEO describing supply chain management, customer relationship management, and enterprise resource planning systems. The presentation should highlight the main benefits Premier One can receive from these strategic initiatives along with any additional added business value that can be gained from the systems.