# Types of Information Systems

There is no one single information system that will satisfy all of the needs of an organization. At first glance it can be difficult to comprehend all the different systems in a business, and even more difficult to understand how they relate to one another.

You’ll see at the end of this discussion the integral role each type of system plays — from determining which kind of candy bar to make (strategic level systems); to how many people the company will need to make the candy bar (management level systems); to tracking customer orders (operational level systems). Within these three levels we’ll discuss the four major types of systems typically used to make an organization successful.

## Transaction Processing Systems

The operational level of an organization includes various units such as order processing, material movement control, payroll, accounts payable, and employee record keeping. This level is responsible for daily operations. The information systems used in this level of the organization are **transaction processing systems (TPS)**, so called because they record the routine transactions that take place in everyday operations. TPS combine data in various ways to fulfill the hundreds of information needs a company requires to be successful. The data are very detailed at this level. For instance, a TPS will record how many pounds of sugar are used in making our Cybernuts candy bar. It also records the time it takes from beginning to end to make the candy bar. And it can record the number of people working on the assembly line when our candy bar is made and what functions they perform.

People using transaction processing systems usually need information to help them answer routine questions such as: “How many Cybernuts candy bars did we produce yesterday?” or “How much sugar do we have on hand for today’s production run?”

Since there’s more to making the Cybernuts bar than just running the assembly line, a TPS will record the sales and marketing transactions as well. The system will record not just the number of dollars used in the marketing program, but also how many stores are actually stocking the candy bar and where the product is located inside the stores.

You have to remember that a lot of work is required to get the product from the manufacturing plant to the store shelves. How much did the company pay to package the product, store the product, and ship the candy bar to the stores? All that data can be recorded in a TPS, right down to how many truck drivers were required to deliver the product to the local convenience store.

As you can visualize, the operational level of an organization also includes functions not directly associated with the actual production of the Cybernuts bar, but vital in keeping the company running smoothly. The people in accounting may not be pouring the chocolate over the nuts on the assembly line, but those workers that do appreciate the fact that they get a paycheck every two weeks. Production workers also like to know that the human resource division is keeping track of training programs that may help them advance within the company. Each of these divisions requires an information system that helps it keep track of the many details that make the production worker happy and productive. The best transaction processing system will be integrated throughout the organization to supply useful information to those who need it when they need it.

**Bottom Line: The transaction processing system records the data from everyday operations throughout every division or department in the organization. Each division/department is tied together through the TPS to provide useful information to management levels throughout the company.**

## Management Information Systems and Decision-Support Systems

Think about the functions of managers that you may have learned about in other classes: directing, controlling, communicating, planning, and decision making. Each manager takes on these roles countless times in a day. Managers review endless amounts of data that make their jobs easier and more efficient.

**Management information systems (MIS)** are designed to produce information on a periodic basis instead of on a daily recurring basis like those using a transaction processing system. Managers also require information on an exception basis. That is, they need to know if production is higher or lower than the targeted rate or if they are over or under their budgets. They also need to know about trends instead of straight numbers. The questions they may ask of the system would be: “How far behind in production are we for this quarter?” or “How many more workers would we need if we increased production by 10,000 candy bars per quarter?” or “If we do adopt the new Cybernuts recipe, what positions are open for the 25 excess workers and what skills do they possess that the company can use elsewhere?”

Before integrated systems, managers received periodic printed reports that gave them lots of data, but often didn’t supply information that they could utilize to make timely decisions. Planning was sometimes a wasted effort because the information the managers needed just wasn’t there when they needed it.

If there was a problem getting a shipment out to the convenience store in Paducah, Kentucky, the shipping manager may not have known about it until a customer cancelled her account six months later. The human resources department manager would likely not be able to find out about new job opportunities in a different part of the company until after the workers were laid off and had found other employment. Worse yet, production might have to stop the assembly lines because accounting hadn’t purchased enough supplies to cover the increase in the number of candy bars rolling off the line.

With the integration of information systems up and down the management levels, and throughout the corporation, managers can often get needed information in a real-time mode. The data are kept online, the system can gather the precise information managers need to make a decision, and the information can be cross integrated into all departments of the company. All divisions in the company can see what’s going on throughout the corporation. Information can be passed from department to department so that they are all working “on the same page.”

**Bottom Line: A management information system is used by managers throughout the organization to help them in directing, planning, coordinating, communicating, and decision making. The MIS will help answer structured questions on a periodic basis.**

**Decision-support systems (DSS)** also serve the management level of an organization, but in a somewhat different way from an MIS. An MIS uses internal data to supply useful information. A DSS uses internal data but also combines it with external data to help analyze various decisions management must make. Analyzing complex, interactive decisions is the primary reason for a company to use a DSS.

The sales and marketing management of WorldWide Candy would use a DSS to answer a semistructured question such as: “What price should we charge for the Cybernuts candy bar so that we can maximize our profits, minimize our costs, and still remain competitive?” Using a DSS, the manager in charge of the manufacturing division could determine the best answer to this semistructured question: “How does the change in the size and packaging of the Cybernuts candy bar affect the other products we produce, not just in shipping, but also on the display shelf at the convenience store?”

You’ll notice we describe decisions at this level as semistructured. Not all decisions required for an organization to function smoothly are cut-and-dried. There are a lot of gray areas in successfully managing an organization and the larger the company, the more diverse the decision-making process becomes.

As a company is affected not only by what goes on solely within the company, but also by external forces not under its control, decision-support systems can help upper-level management. What happens to the pricing structure and availability of the raw materials for the Cybernuts bar if civil war breaks out in the sugar producing countries of Central America? The price of electricity can greatly affect the profit and loss of the Cybernuts bar. Fluctuating gasoline prices affect the profit margins by increasing or decreasing the distribution costs of the product. All these external events can be put into context in a decision-support system so that WorldWide’s management can make effective decisions.

**Bottom line: Decision-support systems are used for complex “what-if” questions that require internal and external data. Decisions at this management level are mostly semistructured so the information system must respond to the unique requirements of the executives.**

## Executive Support Systems for Senior Management

**Executive support systems (ESS)** are used at the very upper echelons of management. At the strategic level, the typical decision is very unstructured. Often there is no specific question, but rather a series of undefined situations executives may face. There are no easy, definable answers. These executives require summarized, historical information gleaned from all other levels of the organization, coupled with large amounts of external data gathered from many sources.

Let’s assume that the Cybernuts bar is the most successful, most popular candy bar ever made. (You could say its success is due to the effective use of the previous three information systems!) The Universal Food Products Corporation just can’t create a product that comes close to the success of Cybernuts (their information systems aren’t as good) and is very envious of WorldWide Candy. So Universal Food Products offers to buy the Cybernuts product from WorldWide for what seems to be an astronomical amount of money. WorldWide executives can use their executive support system to determine if this offer is in the best interest of all. They can analyze the information gathered from all of the internal information systems and couple that with external data to help them make the decision. With an ESS, company executives can make their decision based on information, not on emotion.

Senior executives often access information through the use of a **portal**. Basically, a portal is a Web interface designed to present integrated personalized business content from a variety of sources.

As executives haven’t been using computers that long or don’t have time to fiddle around learning how to type, executive support systems use **digital dashboards** to make them easy to use and provide information in a real-time mode. The ESS must be able to incorporate external information with internal data to offer concise, complete information for the imprecise and incomplete scenarios executives face.

**Bottom Line: An executive support system helps managers make strategic decisions affecting the entire company. The decisions use internal and external data to give executives the information they need to determine the proper course of action in unstructured situations.**

# 2.3 Systems That Span the Enterprise

It’s not unusual to find an organization with three or more different information systems that act as islands. The systems don’t exchange information very well, if at all. Accounting and finance may have a system that serves their needs very well, but they can’t collect information from the system used by manufacturing and production. Sales and marketing is doing its own thing with its system and losing valuable information from the other systems, which could help it do a better job.

## Enterprise Applications

No business can afford disjointed information systems that don’t work together to produce a coherent picture of the entire organization. All the functions of a business must be integrated across traditional lines of demarcation. Islands of information can be devastating to a company if data cannot be shared throughout the company. Even worse, the islands of information can create problems if each faction of an enterprise has differing information that conflicts with other islands of information. These kinds of problems are what gave rise to **enterprise applications** that share the same data anywhere it’s needed in an organization. As networks of all kinds take hold, from the Internet to intranets to extranets, Web-based enterprise applications are increasingly widespread.

The following sections are an overview of four major enterprise applications: enterprise, supply chain management, customer relationship management, and knowledge management systems. We’ll also study each of these systems in depth in future chapters.

### Enterprise Systems

**Enterprise systems** (also known as *enterprise resource planning (ERP)* systems) is used to bridge the communication gap between all departments and all users of information within a company. If the WorldWide Candy Company production department enters information about its processes, the data are available to accounting, sales, and human resources. If sales and marketing is planning a new advertising campaign for the CyberNuts candy bar, anyone anywhere within the organization will have access to that information. Enterprise systems truly allow a company to use information as a vital resource and enhance the bottom line.

The greatest enticement of enterprise systems is the chance to cut costs firm-wide and enhance the ability to pass information throughout the organization. The biggest drawbacks to building enterprise information systems are time, money, and people. Because the installation of the system is so invasive, it takes a tremendous amount of time to install the hardware and software, train people to use it, and rework business processes that will then inevitably change. Many companies find it more trouble than they care to handle.



Figure 2-8: Enterprise Systems

### Supply Chain Management Systems

Even if you properly manage your processes, wring out excess costs from every corner of the organization, and above all, have the best products at the lowest cost, if you can’t get your products to the right customers at the right time what good is all the rest? Managing your supply chain and getting products or services to customers efficiently and effectively is the real key to success.

**Supply chain management** systems offer new opportunities for companies to integrate data and information with their suppliers and customers and ultimately, lower costs for everyone. When WorldWide Candy installed their supply chain management system, a form of **interorganizational systems**, they created a cohesive network for buying raw materials, creating the candy bars, and getting the packaged goods to retail outlets.

Figure 2-9 illustrates an example of a supply chain management system. It shows how a leading manufacturer of office furniture overhauled its supply chain management system to promote optimal lowest-cost delivery plans.



Figure 2-9: Example of a Supply Chain Management System

### Customer Relationship Management Systems

Do you wait for the customer to complain about your poor service before you take a critical look at your business processes? Do you spend more time and money acquiring new customers than you do in keeping your existing ones? Does each functional area of your organization have a completely different and separate viewpoint of your customers? Does your sales and marketing department make promises to your customers that manufacturing and production can’t possibly keep? If you answered yes to one or more of these questions you’re in serious need of a good **customer relationship management** system.

CRM technology isn’t just a nice looking Web site for customers to click through or more reports dumped on managers’ desks that they don’t have time to review. CRM systems involve business processes in all the functional areas and every management level of a firm. The ideal CRM system provides end-to-end customer care from receipt of order through product delivery.

Because of technological limitations in the past, many companies created islands of information in the various functional areas. Sales and marketing at Cybernuts may tell a customer that the product order would ship by the fifteenth. Meanwhile manufacturing and production was experiencing a delay in producing the Cybernuts candy bar because the finance department didn’t purchase enough raw goods. The islands of information prevented each functional area from knowing the situations in other areas. CRM systems help solve some of these disjointed snafus.

CRM also helps a firm cut the costs of keeping good customers by supplying the entire organization with a consolidated view of the customers’ needs. Unprofitable customers are more easily identified with a CRM system and the time and energy spent can be retargeted to more profitable customers.

### Knowledge Management Systems

You may not think of a knowledge management system as an integral part of the overall information system of an organization. Most of the other systems have been recognized for many years, but this one may be thought of as relatively new. **Knowledge management systems** (KMS) enable organizations to better manage processes for capturing and applying knowledge and expertise.

Knowledge workers are those who promote the creation of new knowledge and integrate it into the organization. Research scientists may discover new methods of mixing sugar and cocoa beans and dairy products to make a better chocolate. Maybe a team of engineers will develop a new method of packaging the Cybernuts bar to make it easier to open. The legal knowledge workers may spend their time determining the copyright protections that could be afforded to the Cybernuts product name.

## Intranets and Extranets

Enterprise applications are often costly to implement. Companies that don’t have the resources to invest in enterprise applications can still achieve some measure of information integration by using intranets and extranets.

Intranets and extranets use Internet technology and standards to assemble information from various systems and present it to the user in a Web page format. Extranets make portions of private corporate intranets available to outsiders.

Both of these tools make it easy for companies to disseminate information through a standard platform that requires very little work to maintain. It’s a low-cost way to connect internal employees with each other or external users to company information.

## Collaboration and Communication Systems: “Interaction” Jobs in a Global Economy

Globalization now allows companies to work around the clock, around the world. It’s not unusual for major corporations to shift work from one time zone to another, one country to another. Somehow, the people in all the geographically-separated locations have to be able to easily communicate and share information with each other.

Many new systems for interacting with other employees, managers, vendors, and customers have been developed. You probably use some of them without realizing how essential they’ve become in creating an enterprise-wide information system that companies rely upon.

* **Internet-based collaboration environments:** groupware like Lotus Notes, Groove, and WebEx conferencing systems provide tools that support workgroup collaboration.
* **E-mail and instant messaging**: billions of messages flow everyday between employees, managers, suppliers, and customers
* **Cell phones and Smartphones:** provide instant communications anywhere, anytime.
* **Social networking:** more than just a way to socialize among friends, these tools give corporations another way for users to share ideas and collaborate with each other.
* **Wikis**: gaining in popularity as a way to share knowledge and ideas among collaborators. They are much easier to use and manage than more sophisticated knowledge management systems.
* **Virtual worlds:** able to house online meetings, training sessions, and lounges, this type of tool is gaining popularity as a way to meet, interact, and exchange ideas.

## E-Business, E-Commerce, and E-Government

A common mistake many organizations make is thinking they can simply throw up a Web site, add an e-mail software program for customer communication, and voila′ they are ready to do business in cyberspace. They haven’t addressed any of their internal processes and the possible changes to the way they do business. They’ve spent hundreds of thousands or millions of dollars and can’t get enough sales to support a day’s worth of expenses.

The Internet, extranets, and intranets offer new opportunities to do business in cyberspace. Yet there are many problems associated with developing a company’s **electronic commerce** and **electronic business**. It is easy to put up a snazzy, colorful Web site that looks very pretty and may even be easy to use. It may be a site on the Internet, an intranet, or an extranet. You must consider though, how you’re going to incorporate that part of your business with your other, more established methods of doing business. What internal processes must you change or adapt? What new processes must you establish? What training must you do with the people who will run the e-business, both technical and nontechnical? You can’t keep doing your job the same old way. Lots of businesses have tried and lots of businesses have lost big bucks.

The electronic delivery of government services via the Internet has been fairly successful. Citizens have easy access to forms necessary in many **e-government** programs such as tax payments. Rather than waste time standing in line for vehicle registration and licenses, people can complete these kinds of tasks on the Internet. Perhaps most importantly, e-government has opened the lines of communications between citizens and elected officials and made information access easier and timelier.

**Bottom Line:** **Integrating functions and business processes cut costs and allow systems development that involves the whole firm or industry. Customer resource management and supply chain management give a company the added advantages of end-to-end customer care. Enterprise systems have many challenges but the benefits, when executed properly, are enormous. Knowledge management systems allow an organization to fully integrate their newly acquired knowledge into the current systems.**

# 2.4 The Information Systems Function in Business

Many people focus on the job losses due to technological advances and changes. On the other hand, many new jobs have been created because of technology. **Information systems departments**, previously a small group of people usually assigned to the financial group, have moved into the mainstream of most companies.

## The Information Systems Department

**Programmers** have taken on more important positions within organizations. They must understand not only the technical side of computing, but they must also know the business processes within the company so they can adapt the technology to the needs of the business. **Systems analysts** serve as the bridge between the techies and the nontechies. Heading this group of people are the **information systems managers**. Their importance to businesses has grown as the emphasis on technology’s role within organizations has grown. Just as most organizations have a Chief Financial Officer, the position of **Chief Information Officer** has been created to handle the myriad of problems and opportunities businesses face in today’s technologically driven environment.

If the company is large enough, you may also find a separate **chief security officer** responsible for making sure the organization’s information resources are secure, a, **chief privacy officer** who ensures the company complies with data privacy laws, and a **chief knowledge officer**. This last position is becoming more popular as digital firms increase their reliance on capturing and managing employee knowledge.

Perhaps the most important role of all, though, is the **end user**. The responsibility for successful integration of information systems has extended past the “techies” and become part of everyone’s job. No one is isolated from the effects of computers and technology