

# INFORMATION SYSTEMS & KNOWLEDGE MANAGEMENT

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## GENERAL OBJECTIVES OF THE SUBJECT

At the end of the course, Individuals will know and distinguish the concepts of data, information, and intelligence, understand the four characteristics that describe data, know the purpose of research in assisting business operations, know what a decision support system is and does and to recognize the major categories of databases.

## 5. INFORMATION SYSTEMS & KNOWLEDGE MANAGEMENT

- 5.1 Information, Data, and Intelligence
- 5.2 Global Information Systems
- 5.3 Decision Support Systems
- 5.4 Databases and Data Warehousing
- 5.5 The Internet and Research
- 5.6 Interactive Media and Environmental Scanning

### 5.1 Information, Data, and Intelligence

In everyday language, terms like *information* and *data* are often used interchangeably. Researchers use these terms in specific ways that emphasize how useful each can be.

- a) **Data** are simply facts or recorded measures of certain phenomena (things or events).
- b) **Information** is data formatted (structured) to support decision making or define the relationship between two facts.
- c) **Business intelligence** is the subset of data and information that actually has some explanatory power enabling effective managerial decisions to be made. So, there is more data than information, and more information than intelligence. Think again about the thousands upon thousands of unsummarized facts recorded by Home Depot each day. Each time a product is scanned at checkout, that fact is recorded and becomes data. Each customer's transactions are simultaneously entered into the store's computerized inventory system.

The inventory system structures the data in such a way that a stocking report can be generated and orders for that store can be placed. Thus, the automated inventory system turns data into information. Further, the information from each store's sales and inventory records may be harvested by analysts. The analysts may analyze the trends

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and prepare reports that help Home Depot buyers get the right products into each store or to even suggest places for new Home Depot locations. Thus, the analyst has now completed the transformation of data into intelligence.

**The Characteristics of Valuable Information** - Not all data are valuable to decision makers. Useful data become information and help a business manager make decisions. Useful data can also become intelligence. Four characteristics help determine how useful data may be: relevance, quality, timeliness and completeness.

**Relevance** is the characteristics of data reflecting how pertinent these particular facts are to the situation at hand. Put another way, the facts are logically connected to the situation. Unfortunately, irrelevant data and information often creep into decision making. One particularly useful way to distinguish relevance from irrelevance is to think about how things change. Relevant data are facts about things that can be changed, and if they are changed, it will materially alter the situation. So, this simple question becomes important:

*“Will a change in the data coincide with a change in some important outcome?”*

American consumers’ dietary trends are relevant to Krispy Kreme. If American diets become more health-conscious, then the sales of doughnuts can be affected. This may lead Krispy Kreme to rethink its product offering. However, information on French consumers’ wine preferences is probably irrelevant since it is difficult to think how a change in French wine preferences will affect U.S. doughnut preferences.

**Data quality** is the degree to which data represent the true situation. High-quality data are accurate, valid, and reliable, issues we discuss in detail in later chapters. High-quality data represent reality faithfully. If a consumer were to replace the product UPC from one drill at Home Depot with one from a different drill, not only would the consumer be acting unethically, but it would also mean that the data collected at the checkout counter would be inaccurate. Therefore, to the extent that the cash register is not actually recording the products that consumers take out of the stores, its quality is lowered. Sometimes, researchers will try to obtain the same data from multiple data sources as one check on its quality. Data quality is a critical issue in business research, and it will be discussed throughout this text.

**Timeliness** - Business is a dynamic field in which out-of-date information can lead to poor decisions. Business information must be timely—that is, provided at the right time. Computerized information systems can record events and dispense relevant information soon after the event. A great deal of business information becomes available almost at the moment that a transaction occurs.

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Timeliness means that the data are current enough to still be relevant. Computer technology has redefined standards for timely information. For example, if a business executive at Home Depot wishes to know the sales volume of any store worldwide, detailed information about any of thousands of products can be instantly determined. At Home Depot, the point-of-sale checkout system uses UPC scanners and satellite communications to link individual stores to the headquarters' computer system, from which managers can retrieve and analyze up-to-the-minute sales data on all merchandise in each store.

**Information completeness** refers to having the right amount of information. Managers must have sufficient information about all aspects of their decisions. For example, a company considering establishing a production facility in Eastern Europe may plan to analyze four former Soviet-bloc countries. Population statistics, GDP, and information on inflation rates may be available on all four countries. However, information about unemployment levels may be available for only three of the countries. If information about unemployment or other characteristics cannot be obtained, the information is incomplete. Often incomplete information leads decision makers to conduct their own business research.

**Knowledge Management** - Who has the best pizza in town? The answer to this question requires knowledge. Indeed, you as a consumer, have stored knowledge about many products. You know the best restaurants, best theaters, best bars, and so forth. All of this knowledge helps you make decisions as a consumer. Much of it is based on personal research involving product trials or searches for information. From an individual's perspective, knowledge is simply what you have stored in memory. It helps you make decisions about a variety of things in your life.

Organizations can use knowledge in a similar way. Knowledge is accumulated not just from a single individual, however, but from many sources. Financial managers, human resource managers, sales managers, customer reports, economic forecasts, and custom-ordered research all contribute to an organization's knowledge base. All of this *data* forms the organization's memory. From a company's perspective, **knowledge** is a blend of previous experience, insight, and data that forms organizational memory. It provides a framework that can be thoughtfully applied when assessing a business problem. Business researchers and decision makers use this knowledge to help create solutions to strategic and tactical problems. Thus, knowledge is a key resource and a potential competitive advantage.

Knowledge management is the process of creating an inclusive, comprehensive, easily accessible organizational memory, which can be called the organization's *intellectual*

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*capital.* The purpose of knowledge management is to organize the intellectual capital of an organization in a formally structured way for easy use. Knowledge is presented in a way that helps managers comprehend and act on that information and make better decisions in all areas of business. Knowledge management systems are particularly useful in making data available across the functional areas of the firm. Thus, marketing, management, and financial knowledge can be integrated. Recent research demonstrates how knowledge management systems are particularly useful in new product development and introduction.

The firm's sales force plays a particularly useful role in the knowledge management process. Salespeople are in a key position to have a lot of knowledge about customers and the firm's capabilities. Thus, they are tools both for accumulating knowledge and for turning it into useful information. Market-oriented organizations generally provide both formal and informal methods through which the knowledge gained by salespeople can be entered into a data warehouse to assist all decision makers, not just the sales force.

## 5.2 Global Information Systems

Increased global competition and technological advances in interactive media have given rise to global information systems. A **global information system** is an organized collection of computer hardware, software, data, and personnel designed to capture, store, update, manipulate, analyze, and immediately display information about worldwide business activities. A global information system is a tool for providing past, present, and projected information on internal operations and external activity. Using satellite communications, high-speed microcomputers, electronic data interchanges, fiber optics, data storage devices, and other technological advances in interactive media, global information systems are changing the nature of business.

Consider a simple example. At any moment, **United Parcel Service (UPS)** can track the status of any shipment around the world. UPS drivers use handheld electronic clipboards called **delivery information acquisition devices (DIADs)** to record appropriate data about each pickup or delivery. The data are then entered into the company's main computer for record-keeping and analysis. A satellite telecommunications system allows UPS to track any shipment for a customer.

**RFID stands for radio frequency identification.** It is a new technology that places a tiny chip, which can be woven onto a fabric, onto virtually any product, allowing it to be tracked anywhere in the world. This can provide great insight into the different distribution channels around the world and, potentially, to the different ways consumers acquire and use products. The U.S. military uses RFID technology to assist in its logistics, and Wal-Mart is one of the leading proponents of the technology as it can

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greatly assist in its global information system. With so much diverse information available in a global information system, organizations have found it necessary to determine what data, information, and knowledge are most useful to particular business units.

## 5.3 Decision Support Systems

Business research can be described in many ways. One way is to categorize research based on the four possible functions it serves in business:

- 1) Foundational—answers basic questions. What business should we be in?
- 2) Testing—addresses things like new product concepts or promotional ideas. How effective will they be?
- 3) Issues—examines how specific issues impact the firm. How does organizational structure impact employee job satisfaction and turnover?
- 4) Performance—monitors specific metrics including financial statistics like profitability and delivery times. They are critical in real-time management and in “what-if” types of analyses examining the potential impact of a change in policy.

Of these, it is the performance category that is of most interest to decision support systems. The metrics that are monitored can be fed into automated decision-making systems, or they can trigger reports that are delivered to managers. These form the basis of a decision support system and best typify the way business research assists managers with day-to-day operational decisions. A **decision support system (DSS)** is a system that helps decision makers confront problems through direct interaction with computerized databases and analytical software programs. The purpose of a decision support system is to store data and transform them into organized information that is easily accessible to managers. Doing so saves managers countless hours so that decisions that might take days or even weeks otherwise can be made in minutes using a DSS.

Modern decision support systems greatly facilitate **customer relationship management (CRM)**. A CRM system is the part of the DSS that addresses exchanges between the firm and its customers. It brings together information about customers including sales data, market trends, marketing promotions and the way consumers respond to them, customer preferences, and more. A CRM system describes customer relationships in sufficient detail so that financial directors, marketing managers, salespeople, customer service representatives, and perhaps the customers themselves can access information directly, match customer needs with satisfying product offerings, remind customers of service requirements, and know what other products a customer has purchased.

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## 5.4 Databases and Data Warehousing

A **database** is a collection of raw data arranged logically and organized in a form that can be stored and processed by a computer. A customer mailing list is one type of database. Population characteristics may be recorded by state, county, and city in another database. Production figures and costs can come from internal company records. Modern computer technology makes both the storage and retrieval of this information easy and convenient. Twenty years ago, the population data needed to do a retail site analysis may have required days, possibly weeks, in a library. Today, the information is just a few clicks away.

**Data warehousing** is the process allowing important day-to-day operational data to be stored and organized for simplified access. More specifically, a **data warehouse** is the multitier computer storehouse of current and historical data. Data warehouse management requires that the detailed data from operational systems be extracted, transformed, placed into logical partitions (for example, daily data, weekly data, etc.), and stored in a consistent manner. Organizations with data warehouses may integrate databases from both inside and outside the company. Managing a data warehouse effectively requires considerable computing power and expertise. As a result, data warehouse companies exist that provide this service for companies in return for a fee.

**Input Management** - How does data end up in a data warehouse where it can be used by a decision support system? In other words, how is the input managed? Input includes all the numerical, text, voice, and image data that enter the DSS. Systematic accumulation of pertinent, timely, and accurate data is essential to the success of a decision support system. DSS managers, systems analysts, and programmers are responsible for the decision support system as a whole, but many functions within an organization provide input data. Business researchers, accountants, corporate librarians, personnel directors, salespeople, production managers, and many others within the organization help to collect data and provide input for the DSS. Input data can also come from external sources.

**Internal Records** - Internal records, such as accounting reports of production costs and sales figures, provide considerable data that may become useful information for managers. An effective data collection system establishes orderly procedures to ensure that data about costs, shipments, inventory, sales, and other aspects of regular operations are routinely collected and entered into the computer.

**Proprietary Business Research** - Business research has already been defined as a broad set of procedures and methods. To clarify the DSS concept, consider a narrower view of business research. **Proprietary business research** emphasizes the company's gathering of new data. Few proprietary research procedures and methods are

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conducted regularly or continuously. Instead, research projects conducted to study specific company problems generate data; this is proprietary business research. Providing managers with non-routine data that otherwise would not be available is a major function of proprietary business research. Earlier, we discussed four categories of research. Proprietary research often involves either the testing and/or issues types of research.

**Salesperson Input** - Salespeople are typically a business's boundary spanners, the link between the organization and the external environments. Since they are in touch with these outside entities, they commonly provide essential business data. Sales representatives' reports frequently alert managers to changes in competitors' prices and new product offerings. It also may involve the types of complaints salespeople are hearing from customers. As trends become evident, this data may become business intelligence, leading to a change in product design or service delivery.

**Behavioral Tracking** - Modern technology provides new ways of tracking human behavior. Global positioning satellite (GPS) systems allow management to track the whereabouts of delivery personnel at all times. This is the same system that provides directions through an automobile's navigation system. For example, if your delivery person takes a quick break for nine holes of golf at Weaver Ridge or decides to stop at Gorman's Pub for a couple of beers mid-afternoon, management can spot these as deviations from the appropriate delivery route. Thus, it can help track which employees are doing their jobs well.

Technology also allows firms to track actual customer behavior. While it's true that GPS tracking data of customers is also sometimes possible, as the photograph suggests, the Internet also greatly facilitates customer behavior tracking. For instance, Google tracks the "click-through" sequence of customers. Therefore, if a customer is searching for information on refrigerators, and then goes to BestBuy.com, Google can track this behavior and use the information to let Best Buy know how important it is to advertise on Google and even automate pricing for advertisers.

Purchase behavior can also be tracked at the point of sale. **Scanner data** refers to the accumulated records resulting from point-of-sale data recordings. In other words, each time products are scanned at a checkout counter, the information can be stored. The term *single-source* data refers to a system's ability to gather several types of interrelated data, such as type of purchase, use of a sales promotion, or advertising frequency data, from a single source in a format that will facilitate integration, comparison, and analysis.

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**Outside Vendors And External Distributors** - Outside vendors and external distributors market information as their products. Many organizations specialize in the collection and publication of high-quality information. One outside vendor, the ACNielsen Company, provides television program ratings, audience counts, and information about the demographic composition of television viewer groups. Other vendors specialize in the distribution of information. Public libraries have always purchased information, traditionally in the form of books, and they have served as distributors of this information. Media representatives often provide useful demographic and lifestyle data about their audiences. *Advertising Age*, *The Wall Street Journal*, *Sales and Marketing Management*, and other business-oriented publications are important sources of information. These publications keep managers up-to-date about the economy, competitors' activities, and other aspects of the business environment.

**Computerized Data Archives** - Historically, collections of organized and readily retrievable data were available in printed form at libraries. The *Statistical Abstract of the United States*, which is filled with tables of statistical facts, is a typical example. As with many resources, the *Statistical Abstract* is now available electronically. Users can purchase it via CD-ROM or access it via the Internet. The entire 2000 U.S. census, the 2007 Economic Census, as well as projections through the current year is available at <http://www.census.gov>. More and more data are available in digitized form every day.

Numerous computerized search and retrieval systems and electronic databases are available as subscription services or in libraries. Just as a student can query the school library to find information for a term paper without leaving home, data acquisition for businesses has also become far more convenient in recent years. Today, business people access online information search and retrieval services, such as Dow Jones News Retrieval and Bloomberg Financial Markets, without leaving their offices. In fact, an increasing range of information services can be accessed from remote locations via digital wireless devices.

Modern library patrons can command a computer to search indexes and retrieve databases from a range of vendors. Just as wholesalers collect goods from manufacturers and offer them for sale to retailers who then provide them to consumers, many information firms serve as data wholesalers. **Data wholesalers** put together consortia of data sources into packages that are offered to municipal, corporate, and university libraries for a fee. Information users then access the data through these libraries. Some of the better known databases include Wilson Business Center, Hoovers, PROQUEST, INFOTRAC, DIALOG (Dialog Information Services, Inc.), LEXISNEXIS, and Dow Jones News Retrieval Services. These databases provide all types of information including recent news stories and data tables charting statistical trends.

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DIALOG, for example, maintains more than 600 databases. A typical database may have a million or more records, each consisting of a one- or two-paragraph abstract that summarizes the major points of a published article along with bibliographic information. One of the DIALOG databases, ABI/INFORM, abstracts significant articles in more than one thousand current business and management journals. Many computerized archives provide full-text downloads of published articles about companies and various research topics.

Several types of databases from outside vendors and external distributors are so fundamental to decision support systems that they deserve further explanation. The following sections discuss statistical databases, financial databases, and video databases in slightly more detail.

**Statistical Databases** - Statistical databases contain numerical data for analysis and forecasting. Often demographic, sales, and other relevant business variables are recorded by geographical area. Geographic information systems use these *geographical databases* and powerful software to prepare computer maps of relevant variables. Companies such as Claritas, Urban Decision Systems, and CACI all offer geographic/demographic databases that are widely used in industry.

One source for these huge data warehouses is scanner data. Substituting electronic record keeping like optical scanners for human record-keeping results in greater accuracy and more rapid feedback about store activity. One weakness of scanner data is that not all points of sale have scanner technology. For instance, many convenience stores lack scanner technology, as do most vending machines. Thus, those purchases go unrecorded. The Universal Product Code, or UPC, contains information on the category of goods, the manufacturer, and product identification based on size, flavor, color, and so on. This is what the optical scanner actually reads. If a large percentage of a brand's sales occur in environments without the ability to read the UPC code, the business should be aware that the scanner data may not be representative.

**Financial Databases** - Competitors' and customers' financial data, such as income statements and balance sheets, are of obvious interest to business managers. These are easy to access in financial databases. CompuStat publishes an extensive financial database on thousands of companies, broken down by industry and other criteria. To illustrate the depth of this pool of information, CompuStat's Global Advantage offers extensive data on 6,650 companies in more than 30 countries in Europe, the Pacific Rim, and North America.

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**Video Databases** - Video databases and streaming media are having a major impact on many goods and services. For example, movie studios provide clips of upcoming films and advertising agencies put television commercials on the Internet (see <http://www.adcritic.com>). McDonald's maintains a digital archive of television commercials and other video footage to share with its franchisees around the world. The video database enables franchisees and their advertising agencies to create local advertising without the need for filming the same types of scenes already archived. Just imagine the value of digital video databases to advertising agencies' decision support systems!

**Networks and Electronic Data Interchange** - Individual personal computers can be connected through networks to other computers. Networking involves linking two or more computers to share data and software. **Electronic data interchange (EDI)** systems integrate one company's computer system directly with another company's system. Much of the input to a company's decision support system may come through networks from other companies' computers.

Companies such as Computer Technology Corporation and Microelectronics data services allow corporations to exchange business information with suppliers or customers. For example, every evening Wal-Mart transmits millions of characters of data about the day's sales to its apparel suppliers. Wrangler, a supplier of blue jeans, for instance, shares the data and a model that interprets the data. Wrangler also shares software applications that act to replenish stock in Wal-Mart stores. This DSS lets Wrangler's managers know when to send specific quantities of specific sizes and colors of jeans to specific stores from specific warehouses. The result is a learning loop that lowers inventory costs and leads to fewer stockouts.

## **5.5 The Internet and Research**

When most readers were born, the Internet had yet to enter the everyday vocabulary. In fact, few people outside of a small number of universities and the U.S. Department of Defense had any clue as to what the Internet might be. In the 1960s, mainframe computers revolutionized research by allowing researchers to use research techniques involving large numbers of mathematical computations that previously would have been impossible or, at the least, impractical.

In the 1980s, the mainframe computing power of the 1960s, which was available primarily in large universities, government agencies, and very large companies, was transformed into something that could go on nearly every businessperson's desktop. The personal computer (PC) and simple operating systems like DOS and eventually Windows revolutionized many business applications by making computing power relatively inexpensive and convenient. Today, the widespread usage of the Internet is

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perhaps the single biggest change agent in business research. Since most readers are no doubt experienced in using the Internet, we highlight a few terms and facts about the Internet that are especially useful in understanding business research. In the following pages we discuss the World Wide Web and how to use the Internet for research. However, keep in mind that the Internet is constantly changing. The description of the Internet, especially home page addresses, may be out of date by the time this book is published. Be aware that the Internet of today will not be the Internet of tomorrow.

**Accessing Available Data** - The Internet allows instantaneous and effortless access to a great deal of information. Noncommercial and commercial organizations make a wealth of data and other resources available on the Internet. For example, the U.S. Library of Congress provides full text of all versions of House and Senate legislation and full text of the *Congressional Record*. The Internal Revenue Service makes it possible to obtain information and download a variety of income tax forms.

**Collecting Data** - The Internet is also revolutionizing the way researchers collect data. Later in this text, we discuss in more detail the use of Web-based surveys. In short, questionnaires can be posted on a Web site and respondents can be invited to go to the particular URL and participate in the survey. This cuts down on the expense associated with traditional mail surveys and also reduces error since the data can be automatically recorded rather than transcribed from a paper form into an electronic format.

Furthermore, when a consumer uses the World Wide Web, his or her usage leaves a record that can be traced and observed. For instance, Zappos.com can determine how many pages were visited at their shopping site before a purchase was made. They can see if products were abandoned in the “virtual shopping cart” without a purchase being made. Online auctions provide another mechanism to track consumers’ behavior. Prototype products can be offered for sale in an online auction to help assist with product design, forecasting demand, and setting an appropriate price.

**Navigating the Internet** - The **World Wide Web (WWW)** refers specifically to that portion of the Internet made up of servers that support a retrieval system that organizes information into documents called Web pages. World Wide Web documents, which may include graphic images, video clips, and sound clips, are formatted in programming languages, such as HTML (HyperText Markup Language) and XML (Extensible Markup Language) that allow for displaying, linking, and sharing of information on the Internet.

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The Internet is an **interactive medium** because users click commands and often get customized responses. So the user and equipment can have a continuing conversation. Two or more individuals who communicate one-to-one via e-mail using an Internet service provider are also using interactive media. So are individuals who communicate with many senders and receivers via bulletin boards or chat rooms. Because of its vastness, the Internet is an especially useful source for scanning many types of environmental changes. **Environmental scanning** entails all information gathering designed to detect changes in the external operating environment of the firm. These things are usually beyond the control of the firm, but they still can have a significant impact on firm performance.

Ford Motor Company maintains an Internet-based relationship marketing program that, among other things, helps the automaker scan its environment using the Internet. Its dealer Web site creates a centralized communication service linking dealers via an Internet connection. Its buyer Web site allows prospective buyers to visit a virtual showroom and to get price quotes and financial information. Its owner Web site allows an owner who registers and supplies pertinent vehicle information to get free e-mail and other ownership perks. A perk might be a free Hertz upgrade or an autographed photo of one of the Ford-sponsored NASCAR drivers. In return, Ford collects data at all levels, which allow managers to scan for trends and apply what they learn at a local level.

**Information Technology** - Data and information can be delivered to consumers or other end users via either **pull technology** or **push technology**. Conventionally, consumers request information from a Web page and the browser then determines a response. Thus, the consumer is essentially asking for the data. In this case, it is said to be pulled through the channel. The opposite of pull is push. Push technology sends data to a user's computer without a request being made. In other words, software is used to guess what information might be interesting to consumers based on the pattern of previous responses.

**Smart information delivery** (known by a variety of technical names, including *push phase technology*) allows a Web site, such as the Yahoo portal, to become a one-on-one medium for each individual user. Today's information technology uses "smart agents" or "**intelligent agents**" to deliver customized content to a viewer's desktop. **Smart agent software** is capable of learning an Internet user's preferences and automatically searching out information and distributing the information to a user's computer. My Yahoo! and MyExcite are portal services that personalize Web pages. Users can get stock quotes relevant to their portfolios, news about favorite sports teams, local weather, and other personalized information. Users can customize the

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sections of the service they want delivered. With push technology, pertinent content is delivered to the viewer's desktop without the user having to do the searching.

**Cookies**, in computer terminology, are small computer files that record a user's Web usage history. If a person looks up a weather report by keying a zip code into a personalized Web page, the fact that the user visited the Web site and the zip code entered are recorded in the cookie. This is a clue that tells where the person lives (or maybe where he or she may be planning to visit). Web sites can then direct information to that consumer based on information in the cookie.

**Intranets** - An **intranet** is a company's private data network that uses Internet standards and technology. The information on an intranet—data, graphics, video, and voice—is available only inside the organization or to those individuals whom the organization deems as appropriate participants. Thus, a key difference between the Internet and an intranet is that security software programs, or “firewalls,” are installed to limit access to only those employees authorized to enter the system. Intranets then serve as secure knowledge portals that contain substantial amounts of organizational memory and can integrate it with information from outside sources. For example, Caterpillar has an intranet that includes their knowledge network, a portal that provides Caterpillar employees and dealership personnel with a vast array of information about the company and its product offering.

The challenge in designing an intranet is making sure that it is capable of delivering relevant data to decision makers. Research suggests that relevance is a key in getting knowledge workers to actually make use of company intranets. ***An intranet can be extended to include key consumers as a source of valuable research.*** Their participation in an intranet can lead to new product developments. Texas Instruments has successfully established an intranet that integrated communications between customers and researchers leading to the introduction and modification of its calculators. An intranet lets authorized users, possibly including key customers, look at product drawings, employee newsletters, sales figures, and other kinds of company information.

**Internet2** - As we mentioned earlier, information technology changes rapidly. As sophisticated as the Internet and intranets are today, new technologies, such as Internet2, will dramatically enhance researchers' ability to answer business problems in the future. Internet2 (<http://www.internet2.edu/>) is a collaborative effort involving about 250 universities, government entities (including the military), and corporate organizations. The project hopes to recreate some of the cooperative spirit that created the Internet originally. Internet2 users are limited to those involved with the affiliate organizations. The hope is to create a faster, more powerful Internet by providing

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multimodal access, employing more wireless technologies, and building in global trading mechanisms. Internet2 began as a research tool for the universities and organizations involved in its development.