Glossary

10Base-T A system of connecting computers on a LAN using twisted-pair cable. The method relies on compression to increase raw transfer rates to 10 megabits per second.

24 -7 Operation of an application or database 24 hours a day, 7 days a week. Because the database can never be shut down, performing maintenance is a challenge.

Access speed A measure of disk drive speed. Loosely, the time it takes a disk drive to move to a particular piece of data.

Accounting journal Raw financial transaction data are collected by the accounting department and stored in a journal. Modern accounting requires the use of a double-entry system to ensure accurate data.

Activity-based costing (ABC) ABC allocates costs by examining a detailed breakdown of the production activities. The cost of each process is computed for each different product. The detail provides a better picture of the production cost for each item.

Advanced encryption standard (AES) A new U.S. standard for single-key encryption. Approved in 2001 by the government to replace DES and triple DES. With 128 bit keys, it is substantially more difficult to break; but still very fast to encrypt and decrypt.

Advocacy role Someone in MIS, usually the chief information officer, who bears responsibility for exploring and presenting new applications and uses of MIS within the company.

Agent An object-oriented program designed for networks that is written to perform specific tasks in response to user requests. Agents are designed to automatically communicate with other agents to search for data and make decisions.

American National Standards Institute (ANSI) An organization responsible for defining many standards, including several useful information technology standards.

American Standard Code for Information Interchange (ASCII) American standard code for information interchange. A common method of numbering characters so that they can be processed. For instance, the letter

A is number 65. It is slowly being replaced by the ANSI character set table and the use of international code pages that can display foreign characters.

Angel investor An individual who provides a limited amount of funding to start-up firms. Unlike a partner, the investor is rarely involved in management. The amount of funding is generally small--$25,000 to $100,000.

Antitrust laws A variety of laws that make it illegal to use monopoly power. Some basic (economic) actions to achieve a competitive advantage are illegal. Strategic plans must be evaluated carefully to avoid violating these laws.

Application generator A software tool for developers that helps build software applications. It is usually associated with a DBMS but several standalone tools exist to help create new forms and reports.

Application service provider (ASP) A specialized Internet firm that provides an individual application to other businesses. For example, a reservation system can be run by an ASP to provide services to other companies.

Artificial intelligence (AI) An attempt to build machines that can think like humans. Techniques evolved from this research help solve more complex problems. Useful techniques include expert systems, neural networks, massively parallel computers, and robotics.

Aspect ratio Used to define the ratio of width to height in display screens. Standard definition TV was typically 6:4 (such as 640 x 480). HDTV is generally 16:9 (such as 1920 x 1080). Movies sometimes use a 1.85:1 ratio which is slightly wider than the HDTV 1.77:1.

Assumptions Models are simplifications of real life, so they require assumptions about various events or conditions.

Asynchronous Transfer Mode (ATM) A packet-based network system that uses high-speed transmission lines (150 megabits and over) and routers to maximize network efficiency and throughput.

Attributes Descriptions of an object or entity. For example, a customer object would at least

have attributes for name, phone number, and address.

Auction   In an e-commerce context, a Web-based system where individuals bid for items. Useful when you do not know the exact value of an item or have only a few items to sell. The auction site helps handle payments but charges a percentage fee.

Audit trail   The ability to trace any transaction back to its source. In accounting, transaction values are accumulated on the general ledger and used to create reports. An audit trail is a set of marks or records to point back to the original transaction.

Augmented reality   A display of a real-world scene with computer-generated data added to it. The computer data often adds names, descriptions, or drawings. For instance, a phone camera might be used to display a scene and tags are added to identify points of interest.

Authentication   The ability to verify the source of a message. Dual-key systems are a useful technique. The sender uses a private key to encrypt the message. The recipient applies the sender's public key. If the decrypted message is readable, it had to have come from the alleged sender, because the keys always work in pairs.

Backbone   A high-speed communication line that links multiple subnetworks. It is usually a fiber-optic line.

Backward chaining   In an expert system, the user enters a "conclusion" and asks to see whether the rules support that conclusion.

Bandwidth   Traditionally, the amount of frequency allocated to a communication channel, such as the portion of the spectrum allocated to a single radio or television station. But, the term is commonly used to indicate the basic capacity or transmission speed of a communication channel. For example, 20 megabits per second instead of 5 megahertz.

Bandwidth hogs   On a shared network, a small percentage of users will transmit vastly more data than the average user. ISPs often define pricing methods to penalize heavy users to ensure that more bandwidth or capacity is available for all users.

Barriers to entry   Anything that makes it more difficult for new firms to enter an industry. Several possibilities would violate antitrust laws. An acceptable barrier is the increased use of information systems, which raises the cost of entering an industry because a rival would have to spend additional money on information technology.

Beginners All-purpose Symbolic Instruction Code (Basic)   An early computer programming language designed to be easy to program and to teach. Visual Basic is a current version for Windows programming.

Benchmark   A set of routines or actions used to evaluate computer performance. By performing the same basic tasks on several machines, you can compare their relative speeds. Benchmarks are especially useful when the machines use different processors and different input and output devices.

Best practices   Methods that are known to work for solving specific problems. Most problems, including those in software development, have multiple solutions. Best practices are a collection of techniques for solving problems that have been tested and avoid common mistakes and problems.

BETWEEN   A portion of a SQL statement used to specify a lower and upper bound in a WHERE clause. Commonly used for dates, such as OrderDate BETWEEN 01-Jan-2008 AND 31-Dec-2008.

Bill of materials   Used in manufacturing, it is a list of components used to manufacture a finished product. In an ERP system, data from it is often used to trigger inventory deductions and to add the finished product to inventory.

Bill presentation and payment   Web-based software that automatically displays bills and invoices for customers. The payment side accepts various forms of payment including credit cards and electronic checks. Generally run as a Web service.

Binary data   A collection of ones and zeros called bits. Computer processors operate only on binary data. All data forms are first converted to binary.

Biometrics   A field of study that is trying to determine how to identify people based on biological characteristics. The most common devices are fingerprint and handprint readers.

Bit   The smallest unit of data in a computer.

All data is converted to bits or binary data. Each bit can be in one of two states: on or off. Bits are generally aggregated into collections called a byte.

Bitmap image   A method of storing images. The picture is converted to individual dots that are stored as bits. Once a picture is stored in bitmap form, it is difficult to resize. However, bitmaps are good for displaying photographic images with subtle color shading.

Blog   Web log. Say it fast and you can hear the abbreviation. A special type of Web site with software that makes it easy for a user to enter comments. Typically used as a daily journal.

Bluetooth   A short-range wireless network technology invented by IBM. It is most commonly used for cell-phone devices such as headsets. The data transmits a 1 mbps up to 32 feet. It is one of the few network protocols to automatically encrypt the data. Newer versions offer higher data rates.

Board of directors   A group of people paid to oversee and evaluate the decisions of the company. Technically the CEO reports to the board of directors, but they are charged more with reviewing the CEO's decisions. Most boards have the authority to remove a CEO, but many board members are selected by the CEO.

Boolean search   Searching for data by using the logic operators AND, OR, and NOT conditions in a WHERE statement; for example, find a list of customers where city = "Detroit" and age > 50 and do not own a car.

Bottom-up development   An approach to designing and building systems in which workers build system components to solve each problem as it arises. Eventually the pieces are combined to create an integrated system. The method relies on standards and controls to facilitate cooperation and integration. See also top-down development.

Brainstorming   A group technique in which each individual is asked to come up with possible suggestions to a problem. Any ideas are useful, regardless of how wild they are. Even fanciful ideas could stimulate someone else to improve it or to explore a related area.

Break (report)   A report that organizes output by sections that are based on the data values. Common business examples include reports

by customer or employee, where data for each person is displayed in a group.

Break footer   The section of a break or group report that displays subtotals for the data within the group. See also break.

Break header   The section of a break or group report that displays the column headings for the data within the group. See also break.

Broadcasts   A technique of transmitting messages using radio, micro, or infrared waves. Broadcast messages are sent to all devices in a certain area. Others in the vicinity can also receive the messages.

Browser   A software tool that converts World Wide Web data into a graphical page with hypertext links. Using standard (HTML) commands, companies can offer data and additional links to users. Users simply click on individual words and pictures to retrieve additional data and move to other network sites.

Brute force   An attack on encrypted data that attempts to use every possible key. Can be stopped by using very long keys. For example, using a key or password of only three letters means there are only 26*26*26=17,576 possible values. Even a slow computer can test all combinations in a few seconds.

Bulletin board system (BBS)   Similar to a typical bulletin board, except that people access it from computers. The BBS enables users to store comments, pictures, and files for other people to retrieve. Bulletin boards are usually organized by topics and can be searched for specific phrases or comments. They are a useful way to disseminate information that is of interest to many different people.

Bus   Most computers have special slots called a bus to provide high-speed connections to other devices. Various manufacturers make boards that fit into these slots. The processor can exchange data with these other devices, but performance is sometimes constrained by the design of the bus.

Bus network   A network organizing scheme in which each computer is attached to a common transmission medium. Protocols are needed to determine when a machine can transmit and to recover from collisions.

Business process management (BPM)   Also see workflow software. The concept that

business actions have to be performed in a specific sequence. Managing the process entails finding efficiencies through automating or reordering. For example, purchasing expensive items requires discussions and approvals by a variety of managers.

Business to business (B2B)   Business-to-business electronic commerce; sales by suppliers to other businesses over the Internet; often long-term relationships. See B2C and EDI.

Business to consumer (B2C)   Business-to-consumer electronic commerce; purchases by individual consumers similar to traditional mail-order systems, but conducted on secure Web sites over the Internet.

Byte   A collection of bits. Traditionally, 8 bits make up one byte. From binary arithmetic, an 8-bit byte can hold 2 to the 8th power, or 256, possible numbers. In many systems a byte is used to hold one character.

C   A powerful programming language that is flexible and creates efficient code. A language commonly used to build complex applications and to create commercial software products.

C++   An object-oriented extension of the C programming language. It is commonly used to build commercial software. It produces efficient code and supports the development of reusable objects.

Cable modem   An Internet connection device that translates local area network protocols to run over a television cable line. It can provide transmission speeds around 1.5 Mbps. But the communication line is shared with other users.

Cache   A buffer between the processor and a slower device such as a printer, disk drive, or memory chips. The cache generally consists of high-speed memory. Data is transferred in bulk to the cache. It is then pulled out as it is needed, freeing up the processor to work on other jobs instead of waiting for the slower device to finish.

CAN-SPAM Act   The U.S. Act that makes it illegal to send commercial e-mail messages to people who do not want to receive them. For business, the key is that it makes e-mail messages legal, as long as all of the rules are followed.

Capability maturity model integration

(CMMI)   A system designed at the Carnegie Mellon Software Engineering Institute to help organizations improve their software development processes. A key element is to work toward a formal development model that is measurable and is continually upgraded. The CMMI system is an upgrade of the older CMM process.

Carrier-Sense, Multiple-Access/ Collision Detection (CSMA/CD)   A communications protocol that determines how computers will behave on a shared-medium network. Ethernet protocols rely on CSMA/CD. Other alternatives are Token Ring and packet switching.

Case-based reasoning   An expert system approach that records information in the form of situations and cases. Users search for cases similar to their current problem and adapt the original solution.

Catalog management system   A software tool that holds product descriptions, images, and prices to simplify changing and uploading data to a Web site. It makes it easier to track thousands of products to ensure the Web site data is correct.

CD-ROM   Compact disk-read only memory. Data is stored and retrieved with a laser. A special machine is required to create data on a CD-ROM. Used to hold data that does not change very often. Useful for multimedia applications because a disk can hold about 650 megabytes of data. The format used to store music CDs.

Centralization   A business scheme for performing most operations and making management decisions from one location in an organization. MIS organization can be examined in four areas: hardware, software, data, and personnel. See also decentralization.

Certificate authority (CA)   Dual-key encryption and authentication require that the public key be published and available to others. A certificate authority is an organization that validates the owner's identity, issues the keys, and runs the public directory. Almost anyone can run the software to be a CA, but others must trust that host.

Certifications   Vendors provide exams to test workers in their specific technologies and offer a certificate so that potential employers can

be sure that job applicants possess a defined level of knowledge. Common certifications include Cisco (networks) and Microsoft (server administration and development). The industry constantly argues over whether certifications have value.

Change agents Objects or people who cause or facilitate changes. Sometimes the change agent might be a new employee who brings fresh ideas; other times change can be mandated by top-level management. Sometimes an outside event such as a competitor or a hurricane forces an organization to change.

Change drivers Concepts or products that have altered the way businesses operate. Classic examples include bar code scanners in retail stores, handheld miniterminals or notebooks by delivery firms and salespeople, and reservation systems by travel and entertainment industries.

Charge-back system A scheme for charging other internal departments for services. For example, some firms charge departments a fee based on how often they use the central computer. The goal is to ration a limited resource by avoiding free use and to provide a lever for user departments to hold MIS accountable.

Chart of accounts A listing of all the accounts and subaccounts in the general ledger. It must be defined ahead of time for each business.

Check in A step in version control systems. When a user is finished making changes to a file, the user checks in the file to the repository to make it fully available to other users. The user must first check out the file.

Check out A step in version control systems. A user checks out a file or document to indicate that changes will be made. To prevent concurrency problems, the document is usually locked so that others cannot make changes at the same time. When finished, the user checks in the file.

Chief executive officer (CEO) The head of a company. The person ultimately responsible for setting the direction and policies of the firm. Usually the CEO is also the chairperson of the board of directors.

Chief information officer (CIO) The person who is in charge of the MIS organization within a firm, charged with overseeing operations, setting MIS priorities, and being a top-level advocate for MIS. Also develops and supports strategy for the firm.

Circular reference In a spreadsheet, a set of cells that eventually refer to each other. In the simplest example, cell A1 would use values stored in cell A2, but cell A2 uses the value stored in A1. This technique is sometimes used to create an iterative solution to a model.

Classes Base descriptions of objects. Technically, classes describe generic attributes and methods. Objects are a specific instance of a class.

Click-through rate Used in Web advertising, the percentage of people viewing an online ad who actually click it to see the details on the advertised product or service. By 2000, the average click-through rates had declined to less than 1 percent. But it is not necessarily a good measure of advertising effectiveness.

Client-server network A network configuration in which a few machines are used as file servers and the others (clients) are independent workstations. Shared data is first sent to a file server where it can be examined or transferred by another client.

Client-server organization A method of organizing the MIS function so that some operations are centralized while others are decentralized. The client-server model separates all of the components into two categories: servers or clients. The functions associated with the server tend to be centralized, whereas the client components and tasks are dispersed among the users.

Clip art Artwork created and sold to be used by nonartists. Hundreds of collections are available of people, places, buildings, and other objects. Clip art images are often used to create presentations and illustrate reports.

Clipboard The method used to transfer data between software packages in windows-oriented operating environments. All objects that are cut or copied are placed onto the clipboard, ready to be pasted to another location or another package. Clipboard viewers exist to show the current contents of the clipboard. Some software systems allow

a clipboard to hold several cuttings. Many automatically delete the older cuts—keeping only the most recent.

Clipper chip   An encryption method created by the U.S. top-secret National Security Agency (NSA). It uses a secret algorithm to encrypt and decrypt digital messages. It was particularly designed for digital voice communication. Its key feature is the use of two escrow keys assigned to each chip. If the police decide they want to listen to a conversation between two suspects, they can get a court order, collect the escrow keys, and instantly decrypt the call.

Closed loop   A system or piece of computer code in which every step in a control mechanism is contained inside the system and does not utilize external input. See also feedback.

Closed system   A system that is entirely self-contained and does not respond to changes in the environment. Most closed systems eventually fail due to entropy.

Cloud computing   The process of running the main part of an application on servers on the Internet. The servers are generally scalable and provide redundancy. Cloud services available to the public are usually charged on some type of per-use fee basis so firms can buy the level of computing.

CMYK   Cyan-Magenta-Yellow-Key (black). A color model used in the printing world to precisely define colors. Colors can be expressed by specifying the percentage needed of each of the primary colors. See also RGB.

Coaxial cable   A cable used to transmit data. Cable television is a widespread application. The inner cable is surrounded by a plastic insulator, which is surrounded by a wire mesh conductor and an outer casing. The wire mesh insulates the internal signal wire from external interference.

Cold site   A facility that can be leased from a disaster backup specialist. A cold site contains power and telecommunication lines but no computer. In the event of a disaster, a company calls the computer vendor and begs for the first available machine to be sent to the cold site.

Collision   In networks, a collision arises when two computers attempt to broadcast messages

at the same time. The network protocols need to identify the situation and determine which machine will go first.

Co-location   Installing your computer or network equipment in another's facilities to obtain access to high-speed data communication lines. You pay a fee for use of the facilities, power, cooling, and network usage.

Column   A vertical part of a table that holds data for one attribute of an entity in a database or spreadsheet. For example, a table to describe automobiles will have columns for make, model, and color.

Command-line interface   A method of controlling the computer by typing commands. The user must generally memorize specific commands. Older machines still use them because GUI systems require too much overhead. Some people prefer command lines, because it is faster to type one or two commands than to manipulate an image on the screen.

Commerce server   A software system that runs an e-commerce Web server. It handles the product catalog, searching, a shopping cart, and the payment mechanism. Several vendors sell versions to be run on your own server, or you can lease space on a hosting company.

Commercial off-the-shelf software (COTS) Purchased software for building applications. Relatively popular because it is faster than building from scratch.

Common Business-Oriented Language (COBOL)   An early programming language designed to handle typical transaction-processing tasks. Its death has been predicted for years, but it is hard to throw away billions of lines of code.

Common Object Request Broker Architecture (CORBA)   A model largely developed in the UNIX community that will enable objects to communicate with each other across networks. In particular, it is designed to enable users to combine different data types from various software vendors into a single compound document. The data could reside on any server on the network.

Competitive advantage   Something that makes your company better or stronger than

your rivals. Examples include lower costs, higher quality, strong ties to loyal customers, and control over distribution channels.

Composite key   In defining a database table, each table must have a primary key. When the primary key consists of more than one column, it is referred to as a composite key. The business relationship between the multiple columns are many-to-many.

Compound document   A document that incorporates different types of data: text, graphics, sound, and video. The different objects might be transmitted across a network to be included in a final document.

Computer-aided design (CAD)   Programs that are used to create engineering drawings. CAD programs make it easy to modify drawings. They also make it easier to keep track of material specifications. They can perform spatial and engineering estimates on the designs, such as surface or volume calculations.

Computer-aided software engineering (CASE)   Computer programs that are designed to support the analysis and development of computer systems. They make it easier to create, store, and share diagrams and data definitions. Some versions even generate code. There are two categories of CASE tools: software development and maintenance of existing systems.

Computer-integrated manufacturing (CIM)   Using a computer to control most of the production equipment in a manufacturing environment. The computer can monitor the production statistics. It is also used to set individual machine controls.

Computer ethics   The concept that all of us have an obligation with respect to data. For example, managers have a responsibility to customers to protect personal data, to collect only data that is truly needed, and to give customers the ability to correct errors in personal data.

Computer information system (CIS)   See management information system (MIS).

Composite key   In relational databases, a key that consists of more than one column. The columns are combined to yield a unique primary key.

Concurrency   A situation that arises when applications attempt to modify the same piece of data at the same time. If two people are allowed to make changes to the same piece of data, the computer system must control the order in which it processes the two requests. Mixing the two tasks will result in the wrong data being stored in the computer.

Content management system   Changing text and images on a Web site can be challenging, particularly with thousands of pages and hundreds of contributors. Contributors can write changes in simple text format to a content management system which then formats and uploads the data to the Web site automatically.

Context diagram   The top level of a data flow diagram that acts as a title page and displays the boundaries of the system and displays the external entities that interact with the system.

Continuous quality improvement   The concept that any process can be improved by continually evaluating the system and making adjustments and refinements. The concept is also applied to service processes, but relies on a measurable performance objective.

Converge   The ability of an iterative model to stabilize on a fixed solution. The alternative is that values continually increase and never reach a solution.

Cookies   Small text files that a Web server sends to client computers. When the user returns to a site, the browser automatically returns the cookie file. Servers use them to keep track of transactions—so they know when the same user has returned. Marketers have used them to track individual users on the Web.

Copyright   A legal ownership right granted to the creators of intellectual property. All works are automatically copyrighted. Registering with the copyright office is not required but grants additional protection to the owner.

Critical success factors   A limited number of concrete goals that must be met for the organization to be successful. Identifying these key factors helps determine the strategic directions and highlights the areas that can benefit from improved information systems.

Customer relationship management (CRM)   A system for tracking and integrating all customer data. Salespeople, managers, and

clerks all have access to the same data, so everyone has the same consolidated view of all customer interactions.

Cut, copy, paste   A common mechanism used to transfer and link data between different software packages. The data to be transferred is marked. When it is cut or copied, it is placed on the clipboard. Switching to the second package, the object is pasted into the appropriate location. Dynamic and static links are specified through options in the "paste special" menu. With the cut option, the original object is deleted. With copy, the original is unchanged.

Data   Consists of factual elements (or opinions or comments) that describe some object or event. Data can be thought of as raw numbers or text.

Data administrator   **MIS manager who** is charged with overseeing all of the data definitions and data standards for the company to ensure that applications can share data throughout the company.

Data dictionary   Contains all of the information to explain the terms used to define a system. Often includes report descriptions, business rules, and security considerations.

Data encryption standard (DES)   An older method of encrypting data that was commonly used by financial institutions. With current computer capabilities that can break a DES-encrypted message, DES is no longer considered a secure encryption system.

Data flow diagram (DFD)   A diagramming technique used to analyze and design systems. It shows how a system is divided into subsystems and highlights the flow of data between the processes and subsystems. It displays processes, external entities, files, data flows, and control flows.

Data independence   Separating programs from their data definition and storage. The main advantage is that it is possible to change the data without having to change the programs.

Data integrity   (1) A concept that implies data is as accurate as possible. It means the database contains few errors. (2) Keeping data accurate and correct as it is gathered and stored in the computer system.

Data mart   A small version of a data warehouse. A database designed to hold concise collections of data for retrieval and analysis by managers.

Data mining   An automated system that examines data for patterns and relationships. It is partly based on statistics, but also searches for more specific associations. The results are not always applicable to other situations.

Data mirroring   The ultimate backup technique where all data that is stored on one machine is automatically transferred and stored on a second computer. Useful to prevent loss of data and recover from disasters—particularly when the second computer is located many miles away.

Data store   A file or place where data is stored. In a realistic setting, a data store could be a computer file, a file cabinet, or even a reference book.

Data types   To humans, there are four basic types of data: text and numbers, images, sound, and video. Each data type must be converted to binary form for computer processing.

Data warehouse   A single consolidation point for enterprise data from diverse production systems. The data is typically stored in one large file server or a central computer. Because legacy systems are difficult to replace, some data is copied into a data warehouse, where it is available for management queries and analysis.

Database   A collection of related data that can be retrieved easily and processed by computers; a collection of data tables.

Database administrator (DBA)   (1) A person appointed to manage the databases for the firm. The DBA needs to know the technical details of the DBMS and the computer system. The DBA also needs to understand the business operations of the firm. (2) A management person in the MIS department charged with defining and maintaining the corporate databases. Maintaining data integrity is a key component of the job.

Database management system (DBMS) Software that defines a database, stores the data, supports a query language, produces reports, and creates data-entry screens.

Decentralization   Moving the major operations and decisions out to lower levels

within the firm. In MIS, decentralization has largely been led by the declining cost and improved capabilities of personal computers. See also centralization.

Decision biases Without models and careful analysis, decisions made by people tend to be biased. There are several biases in each of the four systems categories: data acquisition, processing, output, and feedback.

Decision process The steps required to make a decision. It includes problem identification, research, specification of choices, and the final selection. Midlevel managers are often involved in the initial stages and affect the outcome, even though they may not make the final decision.

Decision support system (DSS) System to use data collected by transaction-processing systems to evaluate business models and assist managers in making tactical decisions. There are three major components: data collection, analysis of models, and presentation.

Decision tree A graphical representation of logic rules. Each possible answer to a question or situation leads to a new branch of the tree.

Default value A value that is automatically displayed by the computer. Users can often override the default by deleting the old value and entering a new one. The goal is to choose a value that will almost always be entered, so the user can skip that item.

Dehumanization Some people feel that technology isolates people and decreases our contact with other members of society. Treating people as identification numbers and summary statistics can lead managers to forget the human consequences of their decisions.

Denial of Service (DoS) Preventing legitimate users access to systems and networks. A common Internet trick is to force thousands of zombie computers to flood a server with millions of meaningless messages—preventing anyone else from using the system.

Descriptive model A model that is defined in words and perhaps pictures. Relationships between objects and variables tend to be subjective. Useful for an initial understanding of a system but difficult to evaluate by computer.

Desktop publishing (DTP) The art of creating professional documents with personal computers and small laser printers. Beyond basic word processing, DTP software provides controls to standardize pages, improve the page layout, and establish styles.

Detail section The section in a report that is repeated for every row in the associated tables. It is often used for itemized values, whereas group and page footers are used for subtotals.

Device drivers Small software modules that provide the interface from an operating system to a hardware device. Manufacturers improve and rewrite their device drives, so you should periodically update your system to obtain the newer drivers.

Diagnostic situations Spotting problems, searching for the cause, and implementing corrections. Examples include responding to exception reports to identify problems and potential solutions, and determining why the latest marketing approach did not perform as well as expected.

Dial-back modem A special modem placed on a central computer. When a user attempts to log in, the dial-back modem breaks the connection and calls back a predefined phone number. Its use minimizes the threat of outsiders gaining access to the central computer.

Digital cash An electronic version of money that is provided and verified by a trusted third party. It consists of an encrypted number for a specified value that can only be used one time. It provides for verifiable and anonymous purchases using networks.

Digital certificate Part of an authentication mechanism used with dual-key encryption. Companies that host servers need to encrypt transactions over the Internet. They purchase a digital certificate from a certificate authority and install it on the Web server. The client browser recognizes the certificate key and encrypts the data.

Digital dashboard A visual presentation of broad measures of current activity in an organization. The data is generally displayed as gauges, and the system must be customized for each organization. As part of an executive information system, managers can drill down to get more data.

Digital divide   The distance between those individuals or nations who have network capabilities and those who do not. Despite declining costs, many people and many nations cannot afford the hardware and software. If a large portion of the economy moves online, it could alienate those who cannot afford the network connection.

Digital rights management (DRM)   A combination of encryption and Internet validation for protecting vendor copyrights to prevent unauthorized copying of digital content (software, music, books, movies, and so on).

Digital signature   Any electronic signature technology that verifies the user. U.S. law now recognizes digital signatures as equivalent to handwritten ones. The most secure system is to obtain a digital certificate from a public company that verifies each person's identity. But the IRS accepts a simple PIN issued by the agency as a digital signature.

Digital subscriber line (DSL)   A special phone service connection available to customers within 3 miles of the phone company's switch. It provides about 1 Mbps transmission speed for Internet connections.

Digital video/versatile disk (DVD)   A digital format primarily used for storing video and movies. However, it can also hold audio and traditional computer data. One side of the disk can hold over 3 gigabytes of data.

Direct sequence spread spectrum (DSSS) A network transmission protocol commonly used for wireless connections. It subdivides the allocated frequency to send multiple packets at the same time. Communication packets can shift frequencies at each time slot. By making more efficient use of the spectrum, more data can be transmitted.

Disintermediation   In an e-commerce context, using a Web-based system to skip over sections of the production chain, such as manufacturers selling directly to consumers. The approach can give the manufacturer a higher percentage of the sale price, but risks alienating retailers, resulting in lost sales.

Distribution center (DC)   A central point in a supply chain where incoming bulk goods are split and merged into multiple shipments to the final destination. For example, a truckload of bread would be unloaded and individual boxes

placed on other trucks, along with other food items for distribution to a grocery store.

Distribution channel   The layers of distributors in between the manufacturer and the final customer. If a producer can gain control over this means of getting the product to the consumers, the producer can prevent new rivals from entering the industry. Improved communication systems offer the possibility of eroding control over some distribution channels.

Diverge   The property of an iterative model where successive computations keep leading to larger values (in magnitude). The model never reaches a stable solution. Generally due to insufficient or incorrect feedback mechanisms.

Documentation   Descriptions of a system, its components, the data, and records of changes made to the system.

Domain name system (DNS)   A set of computers on the Internet that converts mnemonic names into numeric Internet addresses. The names are easier for humans to remember, but the computers rely on the numeric addresses.

Download   To transfer files from a remote computer to a local computer (usually a personal computer). See also upload.

Drill down   To use an information system to get increasingly detailed data about a company. In an enterprise information system, the ability to look at overall company data, and then select breakdowns by regions, departments, or smaller levels.

Dot-com   Abbreviation given to the many Internet firms formed in the late 1990s because their Internet names ended with the .com suffix. For a couple of years, having a dot-com name was prestigious and attracted funding. When hundreds of these firms failed in 2000 and 2001, they became known as dot-bombs.

Dots per inch (dpi)   A measure of the resolution of devices including printers and displays. Higher values representing more dots per inch provide more detailed images and text. Some people use the term pixels (ppi) instead of dots.

Drill down   The action in a data analysis package or executive information system where the user clicks a link to obtain more detail

about a specific situation. See also roll up.

Dual-key encryption   A method of encrypting a message that requires two keys: one to encrypt and one to decrypt. One of the keys is a public key that is available to anyone. The other key is private and must never be revealed to other people. RSA is a popular dual-key encryption system. Dual-key systems can also be used to authenticate the users.

Dynamic data exchange   An early method of linking data from multiple sources with the Windows operating system. The software packages literally send messages to other software packages, which enables them to combine and update data. See also dynamic integration as well as Object Linking and Embedding (OLE).

Dynamic host control protocol (DHCP)   The standard Internet method for assigning Internet addresses to a computer. A DHCP server is given a database with a range of IP addresses and it assigns an unused number to a computer when it requests one on startup. The process means that IP addresses on specific computers can change over time unless the computer is allocated a static address in the database.

Dynamic integration   A means of linking data from multiple documents. One compound document (or container) can hold data objects created by other software. As the original data is changed, it is automatically updated in the container document. See also static integration.

e-Business   Electronic business. The process of conducting any type of business over the Internet. It includes all forms of e-commerce and m-commerce, as well as internal processes and Web services.

e-Commerce (EC)   Electronic commerce. The process of selling items over the Internet. The most familiar form is business-to-consumer, but it includes business-to-business and auction sites like eBay.

e-Discovery   Electronic discovery. In legal cases, a request for all electronic data—particularly e-mail communications, but might also include accounting or other data from any computer system. Companies establish policies to define storage life and destruction policies to ensure old data is deleted automatically from systems.

E-mail   Electronic mail, or messages that are transmitted from one computer user to another. Networks transfer messages between the computers. Users can send or retrieve messages at any time. The computer holds the message until the recipient checks in.

EBCDIC: Extended Binary Coded Decimal Interchange Code   A method of numbering characters so that they can be processed by machines. Used exclusively by large IBM and compatible computers. See also ASCII.

Electronic data interchange (EDI) Exchanging transaction data with entities outside the control of your firm. Private connections can be established directly between two firms. Public networks are also being formed where one provider collects data and routes it to the appropriate client.

Encryption   A method of modifying the original information according to some code, so that it can be read only if the user knows the decryption key. It is used to safely transmit data between computers.

End-user development   Managers and workers are to develop their own small systems using database management systems, spreadsheets, and other high-level tools.

Enterprise network   A network that connects multiple subnetworks across an entire firm. Often, the networks use different protocols and different computer types, which complicates transmitting messages.

Enterprise resource planning (ERP)   An integrated computer system running on top of a DBMS. It is designed to collect and organize data from all operations in an organization. Existing systems are strong in accounting, purchasing, and HRM.

Entrepreneurship   The act of creating and organizing a business. Generally, an entrepreneur takes the risks to create a new business in search of a profit.

Ergonomics   The study of how machines can be made to fit humans better. One of the main conclusions of this research in the computer area is that individuals need to be able to adjust input (and output) devices to their own preferences.

Escrow key   In an encryption system, it is a special key that can be used by government

officials to decrypt a secret conversation. The Clipper chip uses escrow keys.

Ethernet   A network communications protocol that specifies how machines will exchange data. It uses a broadcast system in which one machine transmits its message on the communication medium. The other machines listen for messages directed to them.

Ethics   The concept that various elements of society have obligations to the others. In IT, it focuses on the roles of users, developers, and vendors.

Event-driven approach   A user-interface approach where the user controls the sequence or operations and the software responds to these events. Events can range from a simple key-press to a voice command. Modern, window-based software does not follow a sequential process. Instead, actions by users generate events. The programs

respond to these events and alter data or offer additional choices. Typical events include mouse clicks pointing to items on the screen, keystrokes, changes to values, or transmissions from other systems.

Exabyte   A count of the number of bytes one step above petabyte and one below zettabyte. The new IEC definition uses exbibyte for binary data and exabyte only for decimal data which is 10^{18}.

Exbibyte   The new IEC definition for binary-based counting instead of exabyte. The binary version is 2^{60}. Technically 2 raised to the 60th power or 1024*1024*1024*1024*1024*1024 (6 times).

Exception report   Report that is triggered by some event to signify a condition that is unusual and needs to be handled immediately.

Executive information system (EIS)   A type of decision support system that collects, analyzes, and presents data in a format that is easy to use by top executives. To achieve this objective, the EIS is based on a model of the entire company. In most cases the model is presented graphically and the executives retrieve information by pointing to objects on the screen.

Exhaustive testing   Testing every possible combination of inputs to search for errors. Generally not a feasible option, so most

computer systems will always contain errors.

Expert system (ES)   System with the goal of helping a novice achieve the same results as an expert. They can handle ill-structured and missing data. Current expert systems can be applied only to narrowly defined problems. Diagnostic problems are common applications for expert systems.

Expert system shell   A program that provides a way to collect data, enter rules, talk to users, present results, and evaluate the rules for an expert system.

Export   An older method of exchanging data among various software packages. One package exports the data by storing it in a format that can be read by other software. Object Linking and Embedding is a more powerful way to exchange data.

Extensible business reporting language (XBRL)   A specific XML style for reporting financial data in a standard way. Predefined tags are used to mark the financial data to make it easier for computers to extract and compare data from diverse companies.

Extensible markup language (XML)   A tag-based notation system that is used to assign names and structure to data. It was mainly designed for transferring data among diverse systems.

External agents   Entities that are outside the direct control of your company. Typical external agents are customers, suppliers, rivals, and governments. Competitive advantages can be found by producing better-quality items or services at a lower cost than your rivals. Also, many firms have strengthened their positions by building closer ties with their suppliers and customers.

External entity   Objects outside the boundary of a system that communicate with the system. Common business examples include suppliers, customers, government agencies, and management.

Extraction, transformation, and loading (ETL)   The process in data warehouses that involves taking data from existing systems, cleaning it up, and moving it into the data warehouse.

Extranet   A network configured to give certain outsiders, usually customers and suppliers,

limited access to data using Web-based systems.

Extreme programming (XP)   A new version of development loosely based on prototyping. Pairs of developers rapidly build and simultaneously test applications. The goal is to build releases and then modify them to meet the changing needs of the users.

Facsimile (Fax)   A combination scanner, transmitter, and receiver that digitizes an image, compresses it, and transmits it over phone lines to another facsimile machine.

Fault tolerance   The ability of a computer or a system to continue functioning properly even if some of the components fail. Fault-tolerant machines rely on duplication of subsystems with continuous monitoring and automatic maintenance calls.

Feasibility study   A quick examination of the problems, goals, and expected costs of a proposed system. The objective is to determine whether the problem can reasonably be solved with a computer system.

Feedback   Well-designed systems have controls that monitor how well they meet their goals. The information measuring the goals and providing control to the system is known as feedback.

Fiber optic cable   A thin glass or plastic cable that is internally reflective. It carries a light wave for extended distances and around corners.

File server   Computer on a network that is used to hold data and program files for users to share. To be effective, it should use a multitasking operating system.

File transfer protocol (FTP)   A standard method of transferring files on the Internet. If you control a computer, you can give other users access to specific files on your computer without having to provide an account and password for every possible user.

Firewall   A small, fast network computer device that examines every packet entering a company. Rules or filters can be created that will reject certain packets that are known to be dangerous to the network.

First mover   In a model of rivalry, the firm that takes the initial action. Sometimes the first

mover gets a benefit by setting the strategy and the market. But the costs are often higher because the technology is newer. Games such as chess recognize that the first mover has a slight benefit.

Five Forces model   Michael Porter's model used to search for competitive advantage. The Five Forces are: rivals, customers, suppliers, potential competitors, and substitute products.

Floating point operations per second (FLOPS)   The number of mathematical calculations a processor can perform in one second. Typically measured in millions (mega-FLOPS) or billions (giga-FLOPS). Bigger numbers represent faster processors.

Flow chart   An old pictorial method for describing the logic of a computer program. It has largely been replaced by pseudocode.

Font size   An important characteristic of text is its size. Size of type is typically measured in points. For reference, a capital letter in a 72-point font will be approximately 1 inch high.

Forward chaining   In an expert system, the ES traces your rules from the data entry to a recommendation. Forward chaining is used to display questions, perform calculations, and apply rules.

Frame   A related set of information that humans group together. Sometimes groupings can be arbitrary. A concept used in discussing AI applications and human cognition.

Frame relay   A network communication system that uses variable-length packets. It is useful for high-speed, large bursts of data. It is being used for long-distance network communications.

Franchise   A means of organizing companies. Independent operators pay a franchise fee to use the company name. They receive training and benefit from the name and advertising of the parent company. They purchase supplies from the parent company and follow the franchise rules.

Frequency division multiplexing (FDM) Supporting multiple communications at the same time by assigning a specific frequency range to each participant. For example, television and radio stations are assigned specific frequency ranges to avoid collisions.

Front-end processor   A simple communications device for large central computers that accepted all of the terminal wires and then assigned each user to an open communications port on the computer. This device decreased the number of physical access ports required on the computer.

Full duplex   A method of transferring data, usually over phone lines, so that data is transmitted in both directions simultaneously. In terms of speaker phones, it means that people on both ends of a call can talk at the same time. With half duplex, the initial speaker blocks others from talking.

Functions   See methods.

Fuzzy logic   A way of presenting and analyzing logic problems that is designed to handle subjective descriptions (e.g., hot and cold).

General ledger   A collection of accounts that break financial data into specific categories. Common categories include accounts receivable, accounts payable, inventory, and cash.

Geographic information system (GIS)   Designed to identify and display relationships among business data and locations. Used to display geographical relationships. Also used to plot delivery routes and create maps.

Gibibyte   The IEC definition for billion in binary base 2 (2^{30}). It replaces the term gigabyte which now is to be used for decimal billion.

Gigabyte   Approximately 1 billion bytes of data. Technically, 2 raised to the 30th power or 1024*1024*1024 (3 times). It is one step above megabyte and one below terabyte..

Global positioning system (GPS)   A system of 24 satellites created by the U.S. Department of Defense. The civilian receivers will identify a location to within about a few feet. Used for navigation, track vehicles, and plotting delivery routes.

Graphical user interface (GUI)   A system that is based on a graphics screen instead of simple text. Users perform tasks by clicking a mouse button on or manipulating objects on the screen. For example, copies are made by dragging an item from one location on the screen to another. Pronounced as "gooey."

Grid computing   A system that networks multiple computers so that they cooperatively process the designated tasks, effectively functioning as a single computer.

Group breaks   Reports are often broken into subsections so that data in each section is grouped together by some common feature. For example, a sales report might group items by department, with subtotals for each department.

Group decision support system (GDSS)   A type of groupware that is designed to facilitate meetings and help groups reach a decision. Each participant uses a networked computer to enter ideas and comments. Votes can be recorded and analyzed instantly. Comments and discussion are automatically saved for further study.

Groupware   Software designed to assist teams of workers. There are four basic types: communication, workflow, meeting, and scheduling. The most common is communication software that supports messages, bulletin boards, and data file transfers and sharing.

Hacker   Primarily used to indicate a person who devotes a great deal of time trying to break into computer systems.

Hardware   The physical equipment used in computing.

High-bandwidth digital content protection (HDCP)   The digital rights management technology created by the movie and television industries to make it more difficult for people to copy high-definition TV signals. To play protected videos all of your equipment will need to support the HDCP standard.

High-Definition Television (HDTV) Transmission of television signals in digital form. It provides clearer reception. It also supports encrypted transmissions so that broadcasters can control who receives the images. HDTV also supports compression, so that more data (better pictures or more channels) can be transmitted in the same frequency space.

Hot links   See dynamic integration.

Hot site   A facility that can be leased from a disaster backup specialist. A hot site contains all the power, telecommunication facilities,

and computers necessary to run a company. In the event of a disaster, a company collects its backup data tapes, notifies workers, and moves operations to the hot site.

Hub   A network device used to connect several computers to a network. Commonly used in a twisted-pair LAN. A cable runs from each computer's NIC to the hub. The hub is often connected to a router.

Hypertext markup language (HTML)   The standard formatting system used to display pages on the Internet. Special tags (commands inside angle braces, e.g., <HTML>) provide formatting capabilities. Several software packages automatically store text in this format, so users do not have to memorize the tags.

Icon   A small picture on a computer screen that is used to represent some object or indicate a command. A classic example is the trash can used to delete files on the Apple Macintosh.

Image   A graphic representation that can be described by its resolution and the number of colors. They can be stored as bit-mapped or vector images.

Import   An older method of exchanging data among various software packages. Most software (e.g., a database management system) can export or store data in a text file format. Another software package (e.g., a spreadsheet) can import or retrieve this data. Object Linking and Embedding is a more powerful way to exchange data.

Inference engine   Within an expert system, the inference engine applies new observations to the knowledge base and analyzes the rules to reach a conclusion.

Information   Data that has been processed, organized, and integrated to provide insight. The distinction between data and information is that information carries meaning and is used to make decisions.

Information center   An MIS group responsible for supporting end users. It typically provides a help desk to answer questions, programmers who provide access to corporate databases, training classes, and network support people to install and maintain networks.

Information rights management (IRM)   A system to control exactly what each group

can do with digital data, including documents, music, and video files. A good IRM system can prevent a document from being read by outsiders, even if the document is somehow shipped outside the company's computers.

Information system   A collection of hardware, software, data, and people designed to collect, process, and distribute data throughout an organization.

Information technology (IT)   The hardware and software used to create an information system. Sometimes used as an abbreviation for management information systems.

Information threats   There are two classes of threats to information: (1) physical, in the form of disasters; and (2) logical, which consists of unauthorized disclosure, unauthorized modification, and unauthorized withholding of data. The primary source of danger lies with insiders: employees, ex-employees, partners, or consultants.

Information warfare (IW)   The use of information in a conflict setting. It includes protecting your own information, providing misinformation to the enemy, and monitoring and disrupting the enemy's information.

Inheritance   Creation or derivation of objects from other object classes. Each derived class inherits the attributes and methods of the prior class. For example, a savings account object can be derived from an account object. The savings account object will automatically have the same attributes and methods. Attributes and methods specific to the savings account can be added.

Initial public offering (IPO)   The step when firms first sell stock to the public. A method of raising additional funds and a major step for most start-up firms.

Input devices   People do not deal very well with binary data, so all data forms must be converted into binary form for the computer. Input devices—for example, keyboards, microphones, and bar code readers—make the conversion.

Input-Process-Output   A shorthand description of a subsystem. Each subsystem receives inputs and performs some process. The output is passed to another subsystem.

Instant Messaging (IM)   A two-way

electronic communication in real time. Short comments that you type are immediately displayed on the recipient's screen. It generally requires that both parties run the same software.

Integrated data   The practice of combining data from different sources to make a decision. Data can come from different departments throughout the business, and it can come in many different forms. Networks, groupware, and products that support dynamic linking are all useful tools to integrate data to make better decisions.

Integrated Services Digital Network (ISDN)   A set of services, and a transmission and control system, offered by telephone companies. It uses complete digital transmission of signals to improve transmission speed and quality.

Intellectual property   As defined by copyright laws, the concept that property such as music, books, software, and movies can be protected. The laws clearly define the owners of the property and specify that the owners can establish any type of copy protections they desire.

Internet   A collection of computers loosely connected to exchange information worldwide. Owners of the computers make files and information available to other users. Common tools on the Internet include e-mail, ftp, telnet, and the World Wide Web.

Internet Assigned Numbers Authority (IANA)   The Internet committee that is responsible for allocating IP address segments. It generally focuses on technical issues, manages the DNS root zone and coordinates the global numbering system.

Internet Corporation for Assigned Names and Numbers (ICANN)   The Internet committee founded in 1998 that coordinates the Internet naming system. It is largely a political committee, formed within the United States, but with international membership, it discusses new top level domains, internationalization issues and so on.

Internet Engineering Task Force (IETF)   The primary technical committee that defines Internet standards. It is responsible for standards such as router protocols and HTML.

Internet service provider (ISP)   A private

company that provides connections to the Internet. Individuals pay a fee to the ISP. The ISP pays a fee to a higher-level provider (e.g., NSP) to pass all communications onto the Internet.

Intranet   A network within an organization that utilizes standard Internet protocols and services. Essentially, this includes Web sites that are accessible only for internal use.

Intrusion detection system (IDS)   A software tool containing sensors and a set of rules that monitors network traffic looking for attackers. Snort is a commonly-used tool for IDS because it is freely available from the open-source community.

Intrusion prevention system (IPS)   Similar to an IDS but more active. It uses software to monitor network activity and a set of rules to indicate when an attack occurs. It then uses router and system commands to shut down or delay access to attackers.

Iterative solution   Building a model and evaluating it until the parameter values converge to a fixed solution. Sometimes an iterative model will diverge and never reach an acceptable solution. See also circular reference.

Intrusion detection system (IDS)   A combination of hardware and software that monitors packets and operations on the network and computers. It watches for suspicious patterns that might indicate an attack.

Internet Protocol version 6 (IPv6)   A set of standards that define how raw data is transmitted on the Internet and how machines are addressed. Version 6 contains several improvements to the older version 4. For example, version 6 supports 128-bit addresses compared with 32 bits in version 4. It will take several years for people to move to version 6.

Joint application design (JAD)   A method to reduce design time by putting everyone in development sessions until the system is designed. Users, managers, and systems analysts participate in a series of intense meetings to design the inputs (data and screens) and outputs (reports) needed by the new system.

Just-in-time (JIT) inventory   A production system that relies on suppliers delivering

components just as they are needed in production, instead of relying on inventory stocks. JIT requires close communication between manufacturers and suppliers.

Kerberos   A security system created at MIT that enables systems to have a single sign-on. Users log into the Kerberos server and other systems can validate the user's identity from that server. Much simpler than requiring users to log in multiple times. Named after the hound that guards the gates of Hades (spelled Cerberus in Latin).

Kilobyte   Approximately one thousand bytes of data. Technically it is 2 to the tenth, or 1024. The next step up is megabyte.

Knowledge   A higher level of understanding, including rules, patterns, and decisions. Knowledge-based systems are built to automatically analyze data, identify patterns, and recommend decisions.

Knowledge base   Within an expert system, the knowledge base consists of basic data and a set of rules.

Knowledge engineer   A person who helps build an expert system by organizing the data, devising the rules, and entering the criteria into the expert system shell, trained to deal with experts to derive the rules needed to create an expert system. The engineer also converts the data and rules into the format needed by the expert system.

Knowledge Management (KM)   A system that stores information in the context of a set of decisions. It contains cross-references and search methods to make it easy for workers to understand how and why decisions were made.

Last mile   The connection from an ISP to individual households and businesses. In many cases, the most difficult connection to make because of the cost and monopoly control. Most households are limited to a few choices: telephone and cable TV. Some technologies exist to run communications over power lines. The other option is wireless.

Latency   The delay between initiating an action and seeing a result. In communications, it is the delay between sending a message and receiving a reply. Often a problem with satellite connections because the signal must travel huge distances.

Legacy system   Information systems that were created over several years and are now crucial to operating the company. They probably use older technology, and the software is difficult to modify. However, replacing them is difficult and likely to interfere with day-to-day operations. Any changes or new systems must be able to work with the older components.

LIKE   An SQL command used within a WHERE clause to search for patterns in text. Two pattern-matching characters are used. A % (* in Access) matches any characters. An _ (? in Access) matches exactly one character. For example, WHERE LastName LIKE 'Jo*', matches any last name beginning with those two letters.

Limited liability company (LLC)   A legal variation of organizing a company. It protects the owners with the same separation of funds offered to corporations, but because it does not allow it to issue stock, the record keeping is somewhat easier.

Local area network (LAN)   A collection of personal computers within a small geographical area, connected by a network. All of the components are owned or controlled by one company.

Magnetic hard drives   Magnetic hard drives (or disk drives) consist of rigid platters that store data with magnetic particles. Data is accessed by spinning the platters and moving a drive head across the platters to access various tracks.

Magnetic ink character recognition (MICR) A special typeface printed with ink containing magnetic ink. It can be read rapidly and reliably by computers. Banks are the primary users of MICR. Checks are imprinted with MICR routing numbers. MICR readers are more accurate than straight OCR because they pick up a stronger signal from magnetic particles in the ink.

Mail filters   Programs that automatically read e-mail and sort the messages according to whatever criteria the manager prefers. Junk mail can be discarded automatically.

Malware   A generic term used to describe software that does nasty things. It includes viruses, Trojan Horses, spyware, and so on.

Management information system (MIS)

An MIS consists of five related components: hardware, software, people, procedures, and databases. The goal of management information systems is to enable managers to make better decisions by providing quality information.

Manufacturing Resource Planning (MRP II)   An integrated approach to manufacturing. Beginning with the desired production levels, we work backward to determine the processing time, materials, and labor needed at each step. These results generate schedules and inventory needs. Sometimes known as a demand-pull system.

Market basket analysis   A data mining technique pioneered to see if two items are commonly purchased at the same time. Can also be used to identify any pairs of items that are associated with each other.

Mass customization   The ability to modify the production line often enough to produce more variations of the main product. The goal is to cover virtually all of the niche markets.

Materials requirements planning (MRP) An early production system, where at each stage of production, we evaluate the usage of materials to determine the optimal inventory levels.

Mathematical model   A model that is defined by mathematical equations. This format is easy to use for forecasts and for simulation analyses on the computer. Be careful not to confuse precision with accuracy. A model might forecast some value with great precision (e.g., 15.9371), but the accuracy could be quite less (e.g., actual values between 12 and 18).

Mebibyte (MiB)   An International Electrotechnical Commission (IEC) replacement for the term megabyte. Mebibyte is base 2 (2^{20}), megabyte is for base 10 (10^6).

Media   For transmissions, the means of connecting computers in a network. Common methods include twisted-pair and coaxial cable; fiber-optic lines; and radio, micro, and infrared waves.

Media access control (MAC)   The network protocol that governs how data bits are sent across a connection medium. Almost always implemented in a LAN card. It is most commonly noticed when you need to control security based on physical cards—in which case you need the MAC address that is uniquely assigned to every network interface card.

Megabyte   Loosely, 1 million bytes of data. Technically, it is 1,048,576 bytes of data, which is 2 raised to the 20th power or 1024*1024. The next step up is gigabyte.

Megaflops   Millions of floating-point operations per second. A measure of the processor speed, it counts the number of common arithmetical operations that can be performed in one second.

Megahertz   One million cycles per second, a measure of the clock chip in a computer, which establishes how fast a processor can operate.

Menu tree   A graphical depiction of the menu choices available to users in a system.

Metadata   Describes the source data, and the transformation and integration steps, and defines the way the database or data warehouse is organized.

Methods   Descriptions of actions that an object can perform. For example, an employee object could be hired, promoted, or released. Each of these functions would necessitate changes in the employee attributes and in other objects. The methods carry out these changes.

Microsecond   One-millionth of a second. Few computer components are measured in microseconds, but some electrical devices and controllers operate in that range. One microsecond compared to one second is the same as comparing one second to 11.6 days.

Million instructions per second (MIPS)   A measure of computer processor speed. Higher numbers represent a faster processor. However, different brands of processors use different instruction sets, so numbers are not always comparable.

Millisecond   One-thousandth of a second. Disk drives and some other input and output devices perform operations measured in milliseconds. One millisecond compared to one second is the same as comparing 1 second to 16.7 minutes.

Mirror drive   A backup system where data is automatically written to a second disk drive. If the primary drive fails, operations can be

switched instantaneously to the mirror drive.

Model   A simplified, abstract representation of some real-world system. Some models can be written as mathematical equations or graphs; others are subjective descriptions. Models help managers visualize physical objects and business processes. Information systems help you build models, evaluate them, and organize and display the output.

Modem   Modulator-demodulator. A device that converts computer signals into sounds that can be transmitted (and received) across phone lines.

Morphing   Digital conversion of one image into another. The term is an abbreviation of metamorphosis. True morphing is done with digital video sequences, where the computer modifies each frame until the image converts to a new form.

Motherboard   The main board in a computer that contains sockets for the process and RAM. It also contains an interface bus so that interface cards can be added to the system.

Multimedia   The combination of the four basic data types: text, sound, video, and images (animation). In its broadest definition, multimedia encompasses virtually any combination of data types. Today, it typically refers to the use of sound, text, and video clips in digitized form that are controlled by the computer user.

Multitasking   A feature of operating systems that enables you to run more than one task or application at the same time. Technically, they do not run at exactly the same time. The processor divides its time and works on several tasks at once.

Musical Instrument Data Interchange (MIDI)   A collection of standards that define how musical instruments communicate with each other. Sounds are stored by musical notation and are re-created by synthesizers that play the notes.

Nanosecond   One-billionth of a second. Computer processors and memory chips operate at times measured in nanoseconds. One nanosecond compared to 1 second is the same as comparing 1 second to 31.7 years.

Natural language   A human language used for communication with other humans, as opposed to a computer programming language or some other artificial language created for limited communication.

Near-field communication (NFC)   A very short range wireless communication method useful for touchless payments because the short range makes it difficult to intercept the transmission or misidentify the sender. Typically a range of a few centimeters with a relatively low bandwidth. Similar to RFID, but with a shorter range.

Network   A set of items connected together. In MIS, it is typically a connection of computers. And social networks are connections of people.

Network address translation (NAT)   A network configuration where internal computers use non-routable addresses (usually in the 10.0.0.0 range). When connecting to devices on the Internet, the boundary router temporarily assigns a real IP address and then directs the incoming messages to the original computer by changing the address within the packets.

Network attached storage (NAS)   A disk drive unit that stands alone and is connected to the high-speed local area network instead of directly to a single computer. Similar to a SAN but it uses standard network connections and is accessible to any computer attached to the network.

Network effect   The concept that a network becomes more valuable and useful as the number of participants increases. In social networks, larger networks attract more people, enabling them to grow even larger.

Network interface card (NIC)   The communication card that plugs into a computer and attaches to the network communication medium. It translates computer commands into network messages and server commands.

Network operating system (NOS)   A special operating system installed on a file server, with portions loaded to the client machines. It enables the machines to communicate and share files.

Network service provider (NSP)   A high-level Internet service provider offering connections to ISPs. The NSP leases high-speed, high-capacity lines to handle the communication traffic from hundreds of ISPs.

Neural network   A collection of artificial neurons loosely designed to mimic the way the human brain operates. Especially useful for tasks that involve pattern recognition.

Neuron   The fundamental cell of human brains and nerves. Each of these cells is relatively simple, but there are approximately 100 million of them.

Newsgroups   A set of electronic bulletin boards available on the Internet. Postings are continuously circulated around the network as people add comments.

Nondisclosure agreement (NDA)   A written agreement where the signer agrees to keep certain information confidential and not tell anyone. Commonly used by startup companies to keep basic technology, general operating practices, and marketing plans secret.

Normalization   A set of rules for creating tables in a relational database. The primary rules are that there can be no repeating elements and every nonkey column must depend on the whole key and nothing but the key. Roughly, it means that each table should refer to only one object or concept.

Numbers   One of the basic data types, similar to text on input and output. Attributes include precision and a scaling factor that defines the true size or dimension of the number.

Object   A software description of some entity. It consists of attributes that describe the object, and functions (or methods) that describe the actions that can be taken by the object. Objects are generally related to other objects through an object hierarchy.

Object hierarchy   Objects are defined from other base objects. The new objects inherit the properties and functions of the prior objects.

Object Linking and Embedding (OLE)   A standard created by Microsoft for its Windows operating system to create compound documents and dynamically link data objects from multiple software packages. You begin with a compound document or container that holds data from other software packages. These data objects can be edited directly (embedded). Most OLE software also supports dynamic linking.

Object orientation   An approach to systems and programming that classifies data as various objects. Objects have attributes or properties that can be set by the programmer or by users. Objects also have methods or functions that define the actions they can take. Objects can be defined from other objects, so most are derived from the four basic data types.

Object-oriented DBMS   A database system specifically created to hold custom objects. Generally supports developer-defined data types and hierarchical relationships.

Object-oriented design   The ultimate goal of the object-oriented approach is to build a set of reusable objects and procedures. The idea is that eventually, it should be possible to create new systems or modify old ones simply by plugging in a new module or modifying an existing object.

Object-oriented programming (OOP)   The process of writing software using sets of extensible objects. Programmers first create objects that encapsulate internal data structures with software methods. New objects can be created by inheriting properties and methods from more generic classes. A goal of OOP was to encourage reuse of objects to reduce the time it takes to create new applications.

Offshoring   The practice of sending jobs to an outside contractor located in a different country.

One-to-many relationship   Some object or task that can be repeated. For instance, a customer can place many orders. In database normalization, we search for one-to-many relationships and split them into two tables.

Online analytical processing (OLAP)   A computer system designed to help managers retrieve and analyze data. The systems are optimized to rapidly integrate and retrieve data. The storage system is generally incompatible with transaction processing, so it is stored in a data warehouse.

Open operating system   An operating system that is supposed to be vendor neutral. It should run on hardware from several different vendors. When a buyer upgrades to a new machine, the operating system and software should function the same as before.

Online transaction processing (OLTP)   A computer system designed to handle daily transactions. It is optimized to record and protect multiple transactions. Because it is

generally not compatible with managerial retrieval of data, data is extracted from these systems into a data warehouse.

Open source development   A method of creating software where the source code is released to the public and anyone can contribute to the project by writing sections of the code. Usually one person takes the lead to control the integration changes and planning for new releases. The Linux operating system initiated by Linus Torvalds is a common example.

Open system   An open system learns by altering itself as the environment changes.

Operating system   A basic collection of software that handles jobs common to all users and programmers. It is responsible for connecting the hardware devices, such as terminals, disk drives, and printers. It also provides the environment for other software, as well as the user interface that affects how people use the machine.

Operations level   Day-to-day operations and decisions. In a manufacturing firm, machine settings, worker schedules, and maintenance requirements would represent management decisions at the operations level. Information systems are used at this level to collect data and perform well-defined computations.

Optical character recognition (OCR)
The ability to convert images of characters (bitmaps) into computer text that can be stored, searched, and edited. Software examines a picture and looks for text. The software checks each line, deciphers one character at a time, and stores the result as text.

Optimization   The use of models to search for the best solutions: minimizing costs, improving efficiency, or increasing profits.

Output devices   Data stored in binary form on the computer must be converted to a format people understand. Output devices—for example, display screens, printers, and synthesizers—make the conversion.

Outsourcing   The act of transferring ownership or management of MIS resources (hardware, software and personnel) to an outside MIS specialist.

Packets   Network messages are split into packets for transmission. Each packet contains a destination and source address as well as a portion of the message.

Packet switching network   A communications protocol in which each message is placed into smaller packets. These packets contain a destination and source address. The packets are switched (or routed) to the appropriate computer. With high-speed switches, this protocol offers speeds in excess of 150 megabits per second.

Page footer   Data that are placed at the bottom of each page in a report. Common items include page totals and page numbers.

Page header   Data that is placed at the top of every page in a report. Common items include the report title, date, and column labels.

Parallel processing   Using several processors in the same computer. Each processor can be assigned different tasks, or jobs can be split into separate pieces and given to each processor. There are a few massively parallel machines that utilize several thousand processors.

Parameter   Variables in a model that can be controlled or set by managers. They are used to examine different situations or to tailor the model to fit a specific problem.

Patent   Legal protection for products (and sometimes business processes). It grants the owner sole right to sell or create modifications of the product for 20 years. No one can create the same product unless approved by the patent owner.

Peer-to-peer communication   A method of sharing data and information directly with colleagues and peers, instead of transferring data through a shared central server.

Peer-to-peer network   A network configuration in which each machine is considered to be an equal. Messages and data are shared directly between individual computers. Each machine continuously operates as both a client and a server.

Personal digital assistant (PDA)   A small, portable handheld computer designed primarily to handle contacts, schedules, e-mail, and short notes. Some models have more advanced features to support documents, spreadsheets, photos, and music. A few have wireless connections; others have to be synchronized with desktops to transfer e-mail and update

schedules. Replaced by smartphones.

Pebibyte   The new IEC definition for quadrillion bytes in binary (2^{50}) denoted PiB. It replaces the term petabyte which is now to be used for decimal values. Technically 2 raised to the 50th power or 1024*1024*1024*1024*1024 (5 times).

Petabyte   One quadrillion bytes of data. One step above terabyte and one below exabyte. The new IEC definition uses pebibyte for binary data and petabyte for decimal values or 10^{15}.

Phased implementation   An implementation method that introduces the new system in phases or steps. One phase is completed before the next is undertaken. The pieces could be software components, different divisions, different locations, or a similar split.

Phishing   Pronounced as fishing. The act of sending out false messages, typically pretending to be from a bank, in an attempt to get users to provide usernames and passwords to access sensitive systems. Almost any e-mail message purportedly sent to you by a financial institution should be ignored. Anything that does not include your name should be deleted immediately.

Photo-CD   A standardized system created by Kodak to convert photographs to digital (bitmap) form and store them on optical disks.

Pivot table   A tool within Microsoft Excel used to extract and organize data. It enables users to examine aggregated data and quickly see the accompanying detail.

Pixel   Picture element, or a single dot on an image or video screen.

Podcast   An audio message distributed via a Web site designed for storage and playback on an Apple iPod. But the term today includes almost any type of audio file containing messages.

Point of sale (POS) system   A means of collecting data immediately when items are sold. Cash registers are actually data terminals that look up prices and instantly transmit sales data to a central computer.

Polymorphism   In an object design, different objects can have methods that have the same name but operate slightly differently. For example, a checking account object and a

savings account object could each have a method called pay interest. The checking account might pay interest monthly, whereas the savings account pays it quarterly.

Portable document format (PDF)   A file format often used on the Internet. It can display documents with detailed precision, including special fonts and shading. Defined by Adobe, readers are freely available for many machines. Special software must be purchased to create the files.

Precision (numeric)   In computers, numeric precision represents the number of digits stored to the right of the decimal point. So, 10.1234 is more precise than 10.12; however, it is not necessarily more accurate. The original value might not have been measured beyond two digits.

Prediction   Model parameters can be estimated from prior data. Sample data is used to forecast future changes based on the model.

Pretty good privacy (PGP)   A dual-key encryption system based on the Diffie-Hellman approach similar to RSA. Created by Philip Zimmermann and commonly used to encrypt e-mail. Free copies for noncommercial use are still available from MIT.

Primary key   A column or set of columns that contains data to uniquely identify each row in a relational database table. For example, each customer must have a unique identifier, possibly a phone number or an internally generated customer number.

Privacy   (1) The concept that people should be able to go about their lives without constant surveillance, that personal information about people should not be shared without their permission. (2) Collecting personal data only when you have a legitimate use for it, allowing customers to correct and remove personal data. Protecting confidential data so that it is not released to anyone. Giving customers the option so that you do not sell or lease their personal data.

Private key   In a dual-key encryption system, the key that is protected by the owner and never revealed. It is generally a very large number.

Problem boundary   The line that identifies the primary components of the system that are creating a specific problem. Subsystems inside

the boundary can be modified to solve the problem or enhance the system. Subsystems outside the boundary cannot be altered at this time.

Procedures   Instructions that help people use the systems. They include items such as user manuals, documentation, and procedures to ensure that backups are made regularly.

Process   An activity that is part of a data flow diagram. Systems can be built to process goods or to process data. Most information system work focuses on processes that alter data.

Process control   The use of computers to monitor and control the production machines and robots. Production lines generally use many different machines, each requiring several adjustments or settings. Computer control simplifies and speeds the setup.

Process innovation   Evaluating the entire firm to improve individual processes, and to search for integrated solutions that will reduce costs, improve quality or boost sales to gain a competitive advantage. See also reengineering.

Processor   The heart of a computer. It carries out the instructions of the operating system and the application programs.

Product differentiation   The ability to make your products appear different from those of your rivals, thus attracting more customers. Information systems have been used to alter products and provide new services.

Program logic   Writing program code requires defining the steps or logic that the computer should follow to complete a task. A program must also use the correct words, symbols, and punctuation, known as syntax.

Properties   See attributes.

Protect document   A method of restricting changes to Microsoft Office files. A limited version of information rights management that will allow people to read a document but not make changes.

Protocols   A set of definitions and standards that establish the communication links on a network. Networks are often classified by their choice of protocol. Common protocols include Ethernet, Token Ring, and TCP/IP.

Prototyping   An iterative system design tech-

nique that takes advantage of high-level tools to rapidly create working systems. The main objective of prototyping is to create a working version of the system as quickly as possible, even if some components are not included in the early versions.

Pseudocode   A loosely structured method to describe the logic of a program or outline a system. It uses basic programming techniques but ignores issues of syntax and relies on verbal descriptions.

Public key   In a dual-key encryption system, the key that is given to the public. Each person wishing to use dual-key encryption must have a different public key. The key works only in tandem with the user's private key.

Pure Internet plays   Dot-com firms that have no direct tie to traditional business. Firms that make all their revenue from Internet sales or other Internet firms. A popular concept in 1999, but most pure Internet firms failed in 2000 and 2001.

Query by example (QBE)   A visual method of examining data stored in a relational database. You ask questions and examine the data by pointing to tables on the screen and filling in templates.

Query system   A method of retrieving data in a DBMS. It generally uses a formal process to pose the questions (1) what columns should be displayed? (2) what conditions are given? (3) what tables are involved? and (4) how are the tables connected? See query by example and SQL.

Radio frequency identification (RFID) Small, passive computer chips that are powered by radio waves. When triggered by a reader, the chip returns data stored in its memory by modulating the radio signals. Readable range is limited to a few feet or less. If price drops far enough, they might replace bar codes.

Random access memory (RAM)   High-speed memory chips that hold data for immediate processing. On most computers, data held in RAM is lost when the power is removed, so data must be moved to secondary storage.

Rapid application development (RAD) The goal of building a system much faster than with traditional SDLC methods. Using powerful tools (database management system,

high-level languages, graphical toolkits, and objects), highly trained programmers can build systems in a matter of weeks or months. Using workgroups, communication networks, and CASE tools, small teams can speed up the development and design steps.

Read Only Memory (ROM) A type of memory on which data can be stored only one time. It can be read as often as needed but cannot be changed. ROM keeps its data when power is removed, so it is used to hold certain core programs and system data that is rarely changed.

Really simple syndication (RSS) A technique used with blogs to automatically push new versions down to subscribers. Users can configure a Web browser to connect to a favorite blogger. New versions are automatically displayed on the browser.

Reduced instruction set computer (RISC) When designing a RISC processor, the manufacturer deliberately limits the number of circuits and instructions on the chip. The goal is to create a processor that performs a few simple tasks very fast. More complex problems are solved in software. Because RISC processors require fewer circuits, they are easier to produce.

Redundant array of independent Disks (RAID) A system consisting of several smaller drives instead of one large drive. Large files are split into pieces stored on several different physical drives. The data pieces can be duplicated and stored in more than one location for backup. RAID systems also provide faster access to the data, because each of the drives can be searching through their part of the file at the same time.

Reengineering A complete reorganization of a company. Beginning from scratch, you identify goals along with the most efficient means of attaining those goals, and create new processes that change the company to meet the new goals. The term reengineering and its current usage were made popular in 1990 by management consultants James Champy and Michael Hammer.

Relational database A database in which all data is stored in flat tables that meet the normalization rules. Tables are logically connected by matching columns of data. System data—such as access rights, descriptions, and data definition—are also stored in tables.

Repetitive stress injury (RSI) An injury that occurs from repeating a stressful action. For instance, several people have complained that constant typing damages their wrists. Ergonomic design, adjusting your work space, and taking breaks are common recommendations to avoid repetitive stress.

Replay attack If an attacker captures a set of network transmissions, the attacker could replay those same messages by sending them again to gain access to a server or duplicate a financial transaction.

Replication The intentional process of duplicating data in a database so that it can be transported and accessed in multiple locations. The DBMS has the ability to synchronize data changes between the master copy and any replicas.

Report A printed summary or screen display that is produced on a regular basis by a database management system. The main sections of a report are report header, page header, group/break header, detail, group/break footer, page footer, and report footer.

Request for proposal (RFP) A list of specifications and questions sent to vendors asking them to propose (sell) a product that might fill those needs.

Resolution The number of dots or pixels displayed per inch of horizontal or vertical space. Input and output devices, as well as images and video, are measured by their resolution. Higher values of dots per inch yield more detailed images.

Reusability The ultimate goal of object-oriented systems. By defining an object up front and storing it in a repository the object can be used in many applications, instead of requiring developers to recreate it every time a new system is built.

Reverse engineering The process of taking older software and rewriting it to modernize it and make it easier to modify and enhance. Reverse engineering tools consist of software that reads the program code from the original software and converts it to a form that is easier to modify.

RGB   Red-green-blue. A color scheme used for video displays. Colors are specified by identifying the desired strength of each primary color. In most implementations the color value ranges from 0 to 255 (one byte). See also CMYK.

Rivals   Any group of firms that are competing for customers and sales. Similar to competitors, but "competition" carries an economic definition involving many firms. Even an industry with two firms can experience rivalry.

Rivest-Shamir-Adelman (RSA)   Three mathematicians who developed and patented a dual-key encryption system. The term often refers to the encryption technique. It is based on the computational difficulty of factoring very large numbers into their prime components.

Rocket scientists   Mathematically trained financial analysts who build complex mathematical models of the stock market and help create and price new securities.

Router   A communication device that connects subnetworks together. Local messages remain within each subnetwork. Messages between sub-networks are sent to the proper location through the router.

Row   A horizontal element that contains all of the data to describe an entity or object in a relational database or spreadsheet.

Rules   A set of conditions that describe a problem or a potential response. Generally expressed as "If… Then" conditions. Used by expert systems to analyze new problems and suggest alternatives.

Sampler   An input device that reads electrical signals from a microphone and stores the sound as a collection of numbers. It measures the frequency and amplitude of the sound waves thousands of times per second.

Scalability   The ability to buy a faster computer as needed and transfer all software and data without modification. True scalability enables users to buy a smaller computer today and upgrade later without incurring huge conversion costs.

Scope creep   The process in any project where people keep trying to add new features to the project. An easy way to drive a project out of control. As the number of features added begins to exceed the original plan, the costs increase and the project is delayed.

Script kiddie   A lazy attacker who downloads code from the Internet to attempt to find and exploit known holes. Can be stopped by ensuring your software contains all current patches.

Scrolling region   On a data entry form, a subform or section that is designed to collect multiple rows of data. Much like a spreadsheet, the user can move back and forth to alter or examine prior entries.

Search engine optimization   A practice of making a Web site more compatible with search engines. The goal is to make the page appear higher in the list of results when users search for the desired topic. Most good SEO techniques define the page precisely so that it matches exactly how a person perceives the page. Black hat or bad SEO methods try to trick the search engine—which usually results in the site being blacklisted by the search engine.

Secondary storage   Data storage devices that hold data even if they lose power. Typically cheaper than RAM, but slower. Disk drives are common secondary storage devices.

Secure sockets layer (SSL)   A system that provides encryption for Internet transmissions. Commonly used to establish a secure connection between client browsers and e-commerce servers. It is established with dual-key encryption by installing a digital security certificate on the server.

Serifs   The small lines, curlicues, and ornamentation on many typefaces. They generally make it easier for people to read words and sentences on printed output. Sans serif typefaces have more white space between characters and are often used for signs and displays that must be read from a longer distance.

Server farm   A collection of dozens or hundreds of smaller servers. Software allocates tasks to whichever server is the least busy. This approach to scalability is fault-tolerant and easy to expand, but can be difficult to manage.

Service level agreement (SLA)   A formal written agreement between a user group and a service provider that specifies guaranteed

levels of service and compensation for failure to meet those levels. SLAs are commonly used in outsourcing deals to ensure the contracted party is providing adequate levels of service, particularly with network providers.

SharePoint   Microsoft's Web-based tool for teamwork. It supports file sharing, version control, discussion groups, and surveys.

Sign-off   In a systems development life-cycle approach, the approval that managers must give to forms, reports, and computations at various stages of the development. This approval is given when they sign the appropriate documents.

Simple object access protocol (SOAP)   A standard, easy-to-implement method of exchanging information and messages among different computers on the Internet. A protocol that works with XML to support Web-based services.

Simulation   Models are used to examine what might happen if we decide to make changes to the process, to see how the system will react to external events, or to examine relationships in more detail.

Single sign-on   A comprehensive security authentication system so that users can log in (sign on) one time. Once the user's identity has been established, all applications obtain the credentials from a central server to recognize the user and determine access rights.

Social engineering   A method used by attackers to obtain usernames and passwords to obtain illegal access to a system. An attacker might call a user and pretend to be a system administrator asking for confirmation of a password. Relatively easy to stop by never telling your password to anyone. Systems administrators will never need your password.

Social legitimacy   At one time, mainstream organizations were identified by the quality of their presentation and their image. Large firms spend millions of dollars on graphic artists, professional designers, and professional printing. The decreasing cost of computers enables even small organizations to create an image that is hard to distinguish from large organizations.

Social networking   Contacts with friends and businesspeople. Many Web sites such as

Facebook, Flickr, and YouTube were built to support social networking—enabling users to find each other and share information online.

Software   A collection of computer programs that are algorithms or logical statements that control the hardware.

Software as a service (SaaS)   Selling software for usage or monthly fees instead of charging a fixed upfront price. Easiest to implement with cloud computing but it can also be done with in-house software. Upgrades and maintenance are typically included in the price and sometimes the maintenance work is handled by the developing company.

Software maintenance   The act of fixing problems, altering reports, or extending an existing system to improve it. It refers to changes in the software, not to hardware tasks such as cleaning printers.

Software piracy   The act of copying software without paying the copyright owner. With few exceptions (e.g., backup), copying software is illegal. Companies and individuals who are caught have to pay thousands of dollars in penalties and risk going to jail. It is commonly accepted that piracy takes money away from the development of improved software.

Software suites   Collections of software packages that are designed to operate together. Theoretically, data from each package can be easily shared with data from the others. So word processors can incorporate graphics, and spreadsheets can retrieve data from the database management system. Suites are often sold at a substantial discount compared to buying each package separately.

Solid state drive   A disk drive replacement or data storage mechanism that uses electronic components to store data instead of a movable platter. Most SSDs are similar to flash drives but with greater capacity and faster data transfer speeds.

Sound   One of the basic data types. There are two methods to describe sound: samples or MIDI. Digitized (sampled) sound is based on a specified sampling and playback rate, and fits into frequency and amplitude (volume) ranges.

Spam   Unsolicited commercial e-mail, or junk mail. Unwanted messages sent by commercial entities or hackers trying to steal your system

or your money. It makes up over 50 percent of e-mail traffic. Most nations have made it illegal, but it is hard to stop. The name refers to a Hormel meat product, but its use is often attributed to a Monty Python sketch.

Speech recognition   The ability of a computer to capture spoken words, convert them into text, and then take some action based on the command.

Spyware   Software that stealthily installs itself on your computer, records your activities or keystrokes. Commonly used by attackers who collect the data to learn your account passwords. Extremely dangerous because once installed it can gain total access to your system. Software scanning tools can spot most common spyware programs. Windows Vista has other tools to prevent programs from installing themselves without your knowledge.

SQL   A structured query language supported by most major database management systems. The most common command is of the form: SELECT column list FROM table list JOIN how tables are related WHERE condition ORDER BY columns.

Standard operating procedures   A set of procedures that define how employees and managers should deal with certain situations.

Standards   An agreement that specifies certain technical definitions. Standards can be established by committees or evolve over time through market pressures. As technology changes, new standards are created.

Static HTML   Simple HTML pages that are changed only by humans, so they are rarely changed. Generally used only for the prepurchase information stage of e-commerce.

Static integration   A means of combining data from two documents. A copy of the original is placed into the new document. Because it is static, changes made to the original document are not automatically updated. See also dynamic integration.

Statistical quality control (SQC)   The statistical analysis of measurement data to improve quality. Several statistical calculations and graphs are used to determine whether fluctuations are purely random or represent major changes that need to be corrected.

Stock options   A right to purchase a specific

stock at a given price. Often granted to workers and managers in start-up companies. If the company grows rapidly, its stock price should increase. The option owner can cash in the options and receive the difference between the current price and the option price.

Storage area network (SAN)   A method of storing computer data on devices attached to a high-speed local connection instead of placing them into each computer. Separating data from the computer and centralizing it makes it easier to upgrade, control, and provide backups. Fiber optic connections are often used for SAN drives.

Strategic decisions   Decisions that involve changing the overall structure of the firm. They are long-term decisions and are unstructured. They represent an attempt to gain a competitive advantage over your rivals. They are usually difficult and risky decisions. MIS support for strategic decisions typically consists of gathering, analyzing, and presenting data on rivals, customers, and suppliers.

Structured decisions   Decisions that can be defined by a set of rules or procedures. They can be highly detailed, but they are defined without resorting to vague definitions.

Structured walkthrough   A review process in which the objective is to reveal problems, inaccuracies, ambiguities, and omissions in the system's design before the program code is finalized. The users are presented with a prototype or mockup of the proposed system.

Subchapter S corporation   A legal variation of a corporation that can be chosen by the owners. The IRS and some states impose limits on the type of company that can elect this option. It avoids the problem of double taxation by passing income and losses directly to the owners' personal income tax statements.

Supply chain management (SCM) Organizing the entire supply process including vendor selection, parts management, ordering, tracking, payment, and quality control.

Switch   A network device used to connect machines. Unlike a router, a switch creates a virtual circuit that is used by a single machine at a time.

Switching costs   The costs incurred in creating a similar information system when a

customer switches to a rival firm. Information technology creates switching costs because customers would have to convert data, re-create reports, and retrain users.

Synchronization   A method of sending data from multiple computers to provide up-to-date data on both computers. Data changes are sent to each computer participating in the synchronization process to ensure each participant has the same set of data.

Syntax   The set of command words, symbols, and punctuation used by a computer programming language. When writing programs, you must type the exact words and symbols so the computer understands what you want it to do. See also programming logic.

Synthesizer   An electronic device to convert electrical signals into sound. One basic technique is FM synthesis, which generates and combines fixed waves to achieve the desired sound. A newer method combines short digitized samples of various instruments with waveforms to create more realistic sounds.

Sysop   System operator. Person in charge of an electronic bulletin board who organizes files and controls access and privileges.

System   A collection of interrelated objects that work toward some goal.

Systems analysis and design   A refinement of the scientific method that is used to analyze and build information systems.

Systems analyst   A common job in MIS. The analyst is responsible for designing new systems. Analysts must understand the business application and be able to communicate with users. Analysts must also understand technical specifications and programming details.

Systems development life cycle (SDLC)   A formal method of designing and building information systems. There are five basic phases: (1) feasibility and planning, (2) systems analysis, (3) systems design, (4) implementation, and (5) maintenance and review.

T1, T3   An older communication link provided by phone companies. Used to carry digitized analog signals, it is being replaced with ISDN links. T1 refers to a group of 24 voice-grade lines and can carry 1.544 megabits per second (Mbps). A T2 trunk line is equivalent to 96

voice circuits providing 6.312 Mbps. T3 provides 44.736 Mbps, and T4 can carry 139,264 Mbps. Services can be leased at any of these levels, where greater bandwidth carries higher costs.

Table   A method of storing data in a relational database. Tables contain data for one entity or object. The columns represent attributes, and data for each item is stored in a single row. Each table must have a primary key.

Tactical decisions   Tactical decisions typically involve time frames of less than a year. They usually result in making relatively major changes to operations but staying within the existing structure of the organization. MIS support consists of databases, networks, integration, decision support systems, and expert systems.

Telnet   A method supported on the Internet that enables users of one computer to log on to a different computer. Once logged on to the new system, the user is treated as any other user on the system.

Table   The basic method of storing data in a DBMS. Each table represents one object or entity. Relational databases require that tables be defined following specific data normalization rules.

Tebibyte   The new IEC definition for trillion in base 2 (2^{40}). It replaces terabyte which is to be used for decimal numbers. Denoted with TiB.

Telepresence   A large, high-resolution video conferencing system that has the goal of providing a distance meeting as comfortable as in person.

Template   A method of creating objects such as forms, reports, and Web sites to ensure that they follow the same format. A designer creates a template and all objects follow those design standards.

Terabyte   Approximately 1 trillion bytes of data. Technically, it is 2 to the 40th power or 1024*1024*1024*1024 (4 times). The step lower is gigabyte, the step above is petabyte.

Text   The simplest of the four basic data types, it also includes numbers. In its most basic form, text is made up of individual characters, which are stored in the computer as numbers. More sophisticated text is described by its

typeface, font size, color, and orientation (rotation).

Thin client   Simpler hardware than a full-blown personal computer, with minimal software. It is generally used to display applications running on the server and to accept input from the user.

Time division multiplexing (TDM)   A method of sharing a communication medium with multiple users where each computer is allowed to send data for a specified amount of time, then releases it to the next computer. Typically handled by requiring devices to send short packets of data.

Token Ring   A communications protocol that describes when each machine can send messages. A machine can transmit only when it receives a special message called a token. When the message is finished or a time limit is reached, the token is passed to the next machine.

Top-down development   An approach to designing and building systems that begins with an analysis of the entire company and works down to increasing detail. A complete top-down approach is usually impossible because it takes too long to analyze everything. See also bottom-up development.

Total cost of ownership (TCO)   The cost of purchasing and running a client computer (personal computer). A highly subjective number, it typically includes the hardware cost, the software license fees, maintenance costs, and training costs.

Total quality management (TQM)   A management doctrine stating that quality must be built into every process and item. Every step and each person must be dedicated to producing quality products and services.

Track changes   A method in Microsoft Word that highlights the changes made by each person. The original author can then choose to accept or reject each change. A useful groupware tool when several people need to cooperate on writing a document.

Transaction-processing system   A system that records and collects data related to exchanges between two parties. This data forms the foundation for all other information system capabilities. MIS support typically consists

of databases, communication networks, and security controls.

Transborder data flow (TBDF)   The transfer of data across national boundaries. Some countries place restrictions on the transfer of data, especially data that relates to citizens (and, of course, data related to "national security"). Some people have discussed taxing the flow of data.

Transmission medium   The physical method of connecting communication devices. The most common media in use are electrical wires, fiber optics, and radio or micro waves.

Triggered rule   In an expert system, if a rule is used in an application, it is said to have been triggered or fired.

Trojan Horse   A special program that hides inside another program. Eventually, when the main program is run, the Trojan Horse program might delete files, display a message, or copy data to an external computer.

True color   Humans can distinguish about 16 million colors. Devices that can display that many colors are said to display true color. It requires the device to use 3 bytes (24 bits) for each pixel.

Turing test   A test proposed by Alan Turing in which a machine would be judged "intelligent" if the software could use conversation to fool a human into thinking it was talking with a person instead of a machine.

Turn-key systems   Computer application systems designed for a specific task that can be installed easily. Common examples include applications for specific types of businesses, such as a system for physicians or dentists.

Twisted-pair cable   Common dual-line wire. Often packaged as three or four pairs of wires. The cable can be run for only a limited distance, and the signal is subject to interference.

Two-factor authentication   A login process that requires two types of systems for identifying users. The most common examples are: (1) username/password, and (2) a generator card that creates a random number every minute that is synchronized to the central computer.

Typeface   A defined way to draw a set of

text characters. Several thousand typefaces have been created to meet different artistic and communication needs. A common characterization is serif and sans serif typefaces.

Ultra-wideband (UWB)   A wireless communication protocol that is radically different from other wireless systems. Designed for short range, the system uses very low power but very high frequency bandwidth. The low power enables it to be invisible to existing applications, so it can use large amounts of bandwidth to send multiple bits of data at the same time—transmitting in parallel form it can quickly send large files. Proposed as a replacement for physical connection cables, particularly video connectors.

Unicode   An international standard that defines character sets for every modern (living) language and many extinct languages (e.g., Latin).

Uninterruptable power supply (UPS)   A large battery and special circuitry that provide a buffer between the computer and the power supply. It protects the computer from spikes and brownouts.

Universal description, discovery, and integration (UDDI)   A public Web-based directory system designed to enable computers to find and use Web services offered by other companies. For example, someday your computer could automatically find all companies that can use current exchange rates to convert prices.

UNIX   A popular operating system created by Bell Labs. It is designed to operate the same on hardware from several different vendors. Unfortunately, there are several varieties of UNIX, and software that operates on one version often must be modified to function on other machines.

Unstable model   A model that cannot be solved for a single solution. The solution might continually diverge, or it could oscillate between several alternatives, generally due to insufficient or incorrect feedback mechanisms.

Upload   To transfer files from a local computer (usually a personal computer) to a distant computer. See also download.

Usenet   See newsgroups.

User resistance   People often resist change. Implementation of a new system highlights this resistance. Managers and developers must prepare for this resistance and encourage users to change. Education and training are common techniques.

Value chain   A description of the many steps involved in creating a product or service. Each step adds value to the product or service. Managers need to evaluate the chain to find opportunities to expand the firm and gain more sales and profits.

Vector image   A stored collection of mathematical equations, representing lines, circles, and points. These equations can be rescaled to fit any output device or to any desired size. Users deal with the base objects, not the mathematical definitions.

Venture capital   Money offered by specialized firms to start up companies. Banks rarely give money to start-ups, so venture capitalists finance risky ventures in the hope of high profits when the company goes public. Many strings can be attached to the money—including a loss of control.

Version control   Software that tracks changes made to other documents. Often used in software development to enable developers to go back to prior version. It is also available for common business documents and files. A limited version is embedded into Microsoft Word.

Video   One of the basic data types. Video combines the attributes of images and sound. An important attribute is the frames per second definition. U.S. standard video operates at 30 frames per second, movie films run at 24 frames per second. Digitizing video requires capturing and playing back the frames at the appropriate speed.

Videoconference   A meeting tool that transmits images and sound of at least one participant. Often, video cameras are available to everyone involved in the conference. High-end systems enable the participants to control the cameras.

View   A stored query. If you have a complex query that you have to run every week, you (or a database specialist) could create the query and save it as a view with its own name. It is then treated much like a simple table.

Virtual machine (VM)   A software-based definition of a computer that is stored and run on top of a physical computer. A single physical computer can host several VMs. Physical processors, RAM, disk space, and network connections are shared among the VMs. Generally, the physical elements can be reallocated to whichever VM currently needs more capacity.

Virtual mall   A collection of Web-based merchants who join together for marketing purposes. Generally they share a common Web host and the same commerce server software. By sharing costs, they can survive without a huge amount of sales.

Virtual private network (VPN)   Software installed on a company network and on each client that automatically encrypts all communications between the two; useful when workers travel or need to reach the company servers from home using the Internet.

Virtual reality (VR)   Virtual reality describes computer displays and techniques that are designed to provide a realistic image to user senses, including three-dimensional video, three-dimensional sound, and sensors that detect user movement that is translated to on-screen action.

Virus   A malicious program that hides inside another program. As the main program runs, the virus copies itself into other programs. At some point, the virus displays a message, shuts down the machine, or deletes all of the files.

Visual Basic   A modern variation of the BASIC programming language created by Microsoft for application programming in Windows. A variation resides inside many of the Microsoft applications, enabling programmers to manipulate and exchange data among the database, spreadsheet, and word processor.

Visual table of contents   A graphical design method that shows how modules of a system are related. Versions of the technique are also used to display menu trees.

Voice mail   A messaging system similar to telephone answering machines but with additional features like message store and forward. You can use your computer to send messages to coworkers. There are tools that will read e-mail and fax messages over the phone, so managers can stay in touch while they are away from the computer.

Voice over Internet protocol (VoIP)   Connecting telephones to the network and using the Internet to transfer phone conversations—instead of traditional phone lines.

Voice recognition   The ability of a computer to capture spoken words and convert them into text.

Web 2.0   A second generation of Web sites—dedicated to providing shared services such as the social networking sites. The term is not precisely defined and people disagree on what to include, but it excludes first-generation text and EC sales sites.

Webmaster   Specialized IS worker who is responsible for creating, maintaining, and revising a company's World Wide Web site. Webmasters use technical and artistic skills to create sites that attract browsers.

Whois   A utility supported by some operating systems and the network registrars to provide information about the ownership of domain names and Internet access connections. Unfortunately, many people lie (illegally) when they fill out the required information.

Wide area network (WAN)   A network that is spread across a larger geographic area. In most cases, parts of the network are outside the control of a single firm. Long-distance connections often use public carriers.

WiFi   Short for wireless fidelity. An early protocol for defining wireless connections, commonly used in homes and businesses. It has a relatively short range (perhaps 100 meters). Transfer speeds initially were less than 11 mbps (using 802.11b), but have increased to 54 mbps (802.11a and 802.11g), and are potentially up to 100 or 200 mbps (802.11n). The higher speeds are achieved by using multiple frequencies at the same time. Actual speeds are considerably lower (as low as half the rated maximum).

Wiki   A Web site designed to enable multiple people to create and revise content. The most famous is Wikipedia where anyone can create encyclopedic entries. The tools can be used for business teamwork applications.

Wi-Max   A wireless technology designed for relatively high speeds and medium distances—

up to several kilometers. It can support point-to-point transmissions to create high-speed Internet connections to service providers, or multipoint systems to handle many users at the same time. Clearwire and Sprint led the way at installing the technology in the U.S. and joined forces in 2007.

Window   A portion of the computer screen. You can move each window or change its size. Windows enable you to display and use several applications on the screen at one time.

Wisdom   A level above knowledge. Wisdom represents intelligence, or the ability to analyze, learn, adapt to changing conditions, and create knowledge.

Workflow software   A type of groupware that is designed to automate forms handling and the flow of data in a company. Forms and reports are automatically routed to a list of users on the network. When each person adds comments or makes changes, it is routed to the next process.

Workstations   Computers attached to a network, designed for individual use. Typically, personal computers.

World Wide Web (WWW)   A first attempt to set up an international database of information. Web browsers display graphical pages of information, including pictures. Hypertext connections enable you to get related information by clicking highlighted words.

WYSIWYG   What you see is what you get. With a true WYSIWYG system, documents will look exactly the same on the screen as they do when printed. In addition to format, it means that the printer must have the same typefaces as the video display. Color printers use a system to match the colors on the monitor.

Zebibyte   The IEC term for binary counting with the value 2^{70}. It replaces zettabyte, which is to be used for decimal-based counting.

Zero-day attacks   Attacks on computers that are based on flaws found in software that have not yet been patched. The zero-day means attackers found the flaw before or simultaneously with security researchers.

Zettabyte   In the IEC definition, it is the decimal base number 10^{21}. It falls above zettabyte and below yottabyte. The binary version is called zebibyte.

zShops   Amazon.com offers small companies a relatively inexpensive e-commerce solution with little or no fixed costs. Useful for small firms, the system provides marketing, visibility, and a payment mechanism. Amazon more commonly refers to Marketplace shops, but zShops was the original title. By 2010 it was renamed to the Webstore.