

3 Business Industry

A business industry is the one related to the information system that is used in the business operations of a company, or the one that uses the information system. This section describes business systems that are used as the information system of a company, engineering systems that are used in the industrial field, e-business that makes use of IT, consumer appliances that are used by consumers, and industrial devices that are used by a company in its business operations.

3-1 Business System

Business system is a collective term for the information systems used in the business operations of a company. Various business systems are provided depending on the usage purpose.

3-1-1 In-house Information System

In-house information system is an information system used in in-house business operations. The typical kinds of in-house information system are as follows:

- **Bookkeeping/accounting/financial system / Human resource/payroll system / Sales support system**

Each is a system used to implement or support in-house business operations. There are also commercial systems available as **operations-specific packages** that can be used commonly in various industries and business types.

- **XBRL (eXtensible Business Reporting Language)**

This is a markup language that is used in the description of financial statements of companies. This is based on XML that is also a markup language, and the specifications are established by XBRL International (an industrial organization composed of companies and groups related to finance, audit, accounting, and computers).

- **Groupware**

This is software that supports joint activities of groups and organizations with the help of a communication tool and schedule management function, and is used to improve work efficiency.

- **Workflow system**

This is a system that automates routine processes. It includes systems that transmit computerized applications and reports according to a predetermined work procedure,

and also perform approvals.

- **Video conference system**

This is a system that uses a network to enable remote participants of a conference to exchange their opinions in real-time on a television screen. A video conference system that uses a web camera and the Internet is particularly called a **web conference system**.

3-1-2 Mission-critical Business Support System

Mission-critical business support system is a collective term for a system that supports a mission-critical business forming the center of corporate activities. Mission-critical business support systems include those that use a commercial software package, such as an **ERP package**, and those that are specially designed and developed. Software packages (i.e., **business packages**) developed with the purpose of usage in the business field are classified as shown below.

- **Operations-specific package**

This is a software package that supports common business operations in several industries or business types.

Example: **Sales management system, ordering management system, inventory control system, customer management system, production management system, etc.**

- **Industry-specific package**

This is a software package that supports exclusive business operations in a specific industry or business type.

Example: **Distribution information system, logistics information system, financial information system, medical information system, etc.**

The typical mission-critical business support systems are shown below. Such systems can be seen everywhere around us, and these systems (i.e., computers) cooperate mutually to achieve **ubiquitous computing** that supports our daily lives.

- **POS (Point Of Sale) system** (point of sale management / over-the-counter sale management)

This is a system that manages the sales status of products in retail stores, such as convenience stores. Product barcodes are read with the help of a POS register (i.e., POS terminal) on which a barcode scanner is attached, and data collection,

aggregation, and issuance of receipts is performed with the help of a store sales management subsystem called a store controller. This is used in inventory and ordering management, and trend analysis in order to identify the hot-selling products.

- **EOS (Electronic Ordering System)**

This is a system that automatically accepts and places orders. By linking this system with the POS system, effective inventory management can be performed.

- **Electronic banking system**

This is a system that connects the information system of a banking facility and the computer of the business partner over a network, and performs data exchange. It includes **firm banking** in which a banking facility and business partner company are connected over a network, and **home banking** in which a banking facility and individual customer are connected over a network.

- **Electronic medical records system**

This is a system by which the health care information, such as diagnosis and treatment records (i.e., medical chart), are computerized, and then stored and updated. It is used in **EHR (Electronic Health Record)** that is exchanged and shared between medical institutions, and **PHR (Personal Health Record)** that includes health information of an individual.

3-1-3 Administration System and Public Information System

(1) Administration System

The approach to the **administration system** was indicated as an “Early realization of **e-Gov (e-government)**” in the **e-JAPAN initiative** in the year 2000 by the then-Prime Minister. Thereafter, it has been inherited in the “steady promotion of e-Gov and **electronic local governments**.”

- **Basic Resident Register Network System**

This is a system that operates with the purpose of improving the public services and efficiency of administrative affairs. It is linked with the **electronic application and notification system**.

- **GPKI (Government Public Key Infrastructure)**

This is an authentication infrastructure that is used when applications and notifications to an administrative body are to be sent electronically.

- **LGWAN (Local Government Wide Area Network)**

This is a network exclusive to the government that mutually connects the networks within a local government organization and is set up with the purpose of high-level

usage through smooth communication and sharing of information, and helps retain high-level security.

- **EDINET (Electronic Disclosure for Investors NETwork)**

This is an electronic disclosure system for disclosure documents, such as the annual securities report.

(2) Public information system

Public information system is a collective term for systems with a strong public presence. In a public information system, it is necessary to remove the social and economic disparity (i.e., **digital divide**) that arises as a result of the existence of information literacy and the differences in the IT usage environment. This is performed by taking into consideration a **universal design** that provides an environment and services that can be used easily and comfortably by all human beings.

- **GPS (Global Positioning System) application system**

This is a system that uses the positioning system (i.e., GPS) of a man-made military satellite. Currently, it is being used in navigation support of airplanes and in car navigation in combination with **GIS (Geographic Information System)**.

- **ETC (Electronic Toll Collection system)**

This is a system that performs fare adjustment by enabling wireless exchange of the necessary information between a vehicle and the tollgate system when the vehicle passes through an exclusive gate installed at the tollgate.

- **AMeDAS (Automated Meteorological Data Acquisition System)**

This is a system that automatically performs observations of the weather conditions in detail, both temporally and geographically.

- **Smart grid**

This is a power network that enables prevention of electricity failure and adjustment of electric power transmission through a unique power supply and demand control by installing a power controller in the computer.

3 - 2 Engineering System

Engineering system is a collective term for systems that support the production of industrial products. An engineering system can be of various types, ranging from a business processing system that manages the production information, through to a control system for industrial machines and industrial robots.

3-2-1 Production Management

Production management involves the creation and management of a **production plan** stating what is to be produced, when it is to be produced, and in what quantity. When a production plan is created, it is important to select an appropriate **production system**.

[Typical production systems]

- **Build-to-order production system**

This is a system (or form) that an order is received and the ordered quantity is produced.

- **Build-to-stock production system**

This is a system (or form) that the quantity for stock replenishment is produced on the basis of the production plan.

- **Continuous production system**

This is a low-mix high-volume production system that the same product is produced continuously for a fixed period of time.

- **Individual production system**

This is a high-mix low-volume production system that carries out production according to each individual order.

- **Lot production system**

This is a system that the production quantity is compiled according to the product type, and several products are produced alternately in units of lots. This production system is positioned somewhere in the middle of continuous production and individual production.

- **Cell production system**

This is a production system that a single operator or several operators are in charge of all processes of production. It is suitable for varied and flexible high-mix low-volume production.

- **Line production system**

This is a production system that each operator is in charge of only a part of the assembly line of the production process. Although division of work is necessary on the basis of standardization, simplification, and specialization, it is suitable for low-mix high-volume production of products whose specifications do not change over a long period of time.

- **JIT (Just In Time) production system**

This is a system that the required products are produced at the required time and only in the required quantity.

- **Process production system**

This is a system that products are manufactured by means of the chemical reaction

of the raw materials. It is suitable for low-mix high-volume production when the setup frequency is extremely low.

Moreover, in order to evaluate the production plan, it is necessary to decide beforehand various **productivity indicators**, such as labor productivity and capital productivity.

3-2-2 Production Process

In the **production process**, the production line is organized according to the production plan, and products are thus manufactured. At this time, the activities that are performed manually and those that can be substituted by machines are clearly identified. The productivity should be improved by performing automatic production management as much as possible.

[Example of automatic production management]

- **NC (Numerical Control) machine tool**

This is a machine tool that is controlled by giving instructions on the usage path of the tool for a work piece and the work process necessary for processing on the basis of corresponding numerical information.

- **Automatic monitoring equipment**

This is equipment for monitoring the operational status and production status (e.g., whether or not the production quantity is as planned) of a production line automated by industrial robots.

- **Automated guided vehicle**

This is a vehicle (e.g., fork lift) that performs unmanned transport of raw materials and products by using a magnetic marker (i.e., a mark that emits magnetism) installed on the floor area.

- **Automated warehouse**

This is an unmanned warehouse that automatically controls the equipment (e.g., belt conveyors) used to transport goods in the warehouse. It also includes warehouses that link with the inventory management function and manage the actual number of pieces.

3-2-3 Production System

Production system is a collective term for systems that support the production management and the production process of products. The general system chart of a production system is as shown in Figure 2-4.

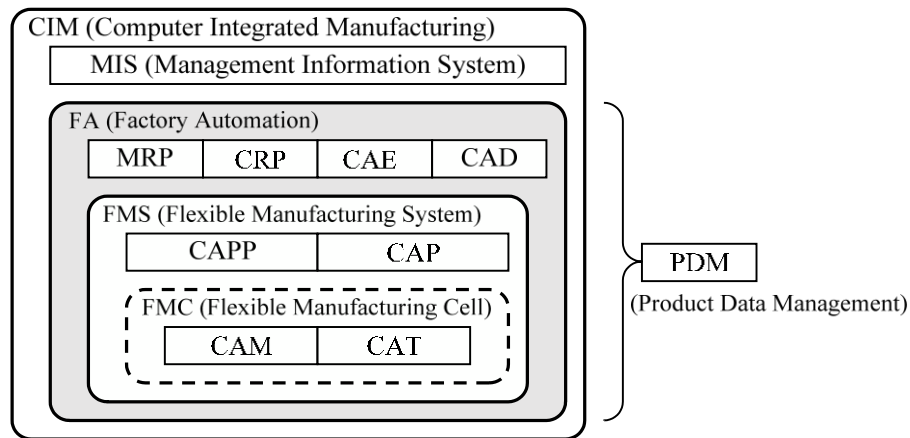


Figure 2-4 System chart of production system

- **CIM (Computer Integrated Manufacturing)**

This is a system by which processes from creation of business strategy up to production are performed in an integrated manner.

- **MIS (Management Information System)**

This is a system through which information on corporate management is managed.

- **FA (Factory Automation)**

This is a system that aims to improve work efficiency by promoting automation of the machines and equipment in the factory through the use of computers.

- **MRP (Material Requirements Planning)**

This is a system by which the flow of resources from the raw material necessary for production up to the finished product is planned and managed on the basis of the production plan. The net requirement of the necessary resources is determined on the basis of the bill of materials, and the procurement plan of resources is created.

- **CRP (Capacity Requirements Planning)**

This is a system that creates and manages the work plan of the process unit on the basis of the performance load of the devices that is used in each process.

- **CAE (Computer Aided Engineering)**

This is a system that supports research (e.g., intensity, mechanism) related to the product.

- **CAD (Computer Aided Design)**

This is a system that supports activities related to the design of the product. Techniques that are used in this system include computer graphics and geometric modeling.

- **FMS (Flexible Manufacturing System)**

This is an automated manufacturing system by which the manufacturing process from management of resources up to management of processes is integrated and controlled.

- **CAPP (Computer Aided Process Planning)**

This is a system by which the manufacturing procedure and processes of the machines used are planned.

- **CAP (Computer Aided Planning)**

This is a system by which the schedule of activities and machines for manufacturing is planned.

- **FMC (Flexible Manufacturing Cell)**

This is a system that automatically controls the cell, which is the unit of processing and assembly at each stage of the manufacturing process, with the help of a computer.

- **CAM (Computer Aided Manufacturing)**

This is a system that supports the production activities of the product. It instructs the work process to the NC machine tool with the help of an NC program, and performs automatic operations.

- **CAT (Computer Aided Testing)**

This is a system that automatically tests whether or not the product shape and the functions are according to the design.

- **PDM (Product Data Management)**

This is a system that performs consolidated management of various types of data of all processes, from production planning and research development up to manufacturing, during the design and the manufacturing of industrial products.

3 - 3 e-business

E-business refers to the overall business techniques that actively make use of IT, such as computers and networks.

3-3-1 EC (Electronic Commerce)

EC (Electronic Commerce) is a mechanism by which a company, organization, or individual performs sales, commodity distribution, advertising, and payment services by using a network.

Depending on the form of transaction, EC can be classified as shown below.

Name		Form of transaction
B to B	Business to Business	EC between companies
B to C	Business to Consumer	EC between company and individual consumer
C to C	Consumer to Consumer	EC between individual consumers
B to E	Business to Employee	EC between company and employees
G to B	Government to Business	EC between the government/local authorities and companies
G to C	Government to Citizen	EC between the government/ local authorities, and citizens

(1) Electronic ordering system

EOS (Electronic Ordering System) is a term for systems that support acceptance and placement of orders using a network, such as the Internet.

- **Online mall (cyber mall, virtual mall)**

This is a site that is a collection of retail stores and mail order houses on the Internet. It is a “B to C” form of transaction including **online shopping** where customers buy the products of their choice.

- **Electronic procurement system**

This is a system through which, when a company or a public organization procures external resources, a decision is made concerning the supplier by performing **electronic bidding** via the network after the required conditions have been provided. Procurement between companies is performed in the “B to B” form, and electronic bidding, such as public works, is performed in the “G to B” form.

- **e-marketplace (Electronic marketplace, Internet business center)**

This is a site that is a collection of seller companies and buyer companies on the Internet. It is a “B to B” form of transaction in which products are traded on a site.

- **Electronic auction (Internet auction)**

This is an auction that is performed over an Internet site. It is a “C to C” form of transaction in which the seller (i.e., individual) exhibits its products on an auction site, and buyers (i.e., individuals) perform bidding, with the person offering the highest price becoming the successful bidder. Another type of auction is a **reverse auction**, where a buyer indicates the object(s) he/she wants to buy and the purchase conditions, and either an individual or several sellers respond to this demand.

(2) Electronic payment system

Electronic payment system is a collective term for systems by which a transaction is settled electronically (for example, charges are given and received). The typical electronic payments used in EC are as shown below. In an electronic payment system, the security of communications is ensured through **SSL (Secure Sockets Layer)**.

- **Internet banking**

This is a mechanism by which financial trading is performed with a bank by using the Internet, and it is used in account transfers and payment of transaction charges through account transfers. Since a dedicated terminal or dedicated software is not needed as in the electronic banking system, this system is used not only by corporations such as companies, but also by individual consumers, in large numbers. Moreover, net banks with Internet banking as their main component are also seen.

- **EFT (Electronic Fund Transfer)**

This is a mechanism by which funds are transferred (i.e., paid) electronically between banks and between accounts according to instructions from the requesting person. Generally, this method is used for payment between companies.

- **Electronic money**

This refers to money that is exchanged as electronic data instead of conventional money, and is used for payment by an individual consumer. The main electronic money services include the prepaid type known as Edy and the postpaid type known as iD.

A mechanism of implementing a transaction that does not use conventional money with the help of an electronic payment card is also an electronic payment system. The cards that are used include **credit cards** used for deferred payments, **prepaid cards** that involve advanced payments, and **debit cards** (cash cards) where the payment amount is immediately withdrawn from the bank account. Examples of other cards are Suica, PASMO, ICOCA, TOICA, Kitaca, and SUGOCA, which are used for transport facilities and can also be used for shopping.

A **card system** that uses the cards described below to record electronic information is used in the electronic payment system.

- **Magnetic card**

This is a card in which information can be recorded in the magnetic strip of the card. Since there is no mechanism for preventing unauthorized writing/reading, the reliability of this card is low.

- **IC card (Smart card)**

This is a card in which information can be recorded in an IC chip embedded in the card. Since data can be encrypted and access control is possible, this card has a high

level of reliability.

- **RFID (Radio Frequency IDentification)**

This refers to a contactless automatic recognition technology that uses radio waves or electromagnetic waves. Information is exchanged without contact by using an IC chip equipped with an antenna called an IC tag. Since RFID is resistant to dust and can read the recorded information even from outside the package, it is applicable in **traceability systems** that trace the path from production to distribution of products, product management, and entry and exit control for a building.

(3) e-business utilization techniques

In addition to EC, various forms and techniques are also used in e-business. This subsection describes the techniques and the concepts of promoting e-business.

- **Internet business**

This is a collective term for business models, including EC, which uses the Internet. There are various business models, including the **content model** that provides attractive contents and ensures sufficient customers, and the **portal model** that manages portal sites, such as Yahoo! and Google, which act as entry points on the WWW.

- **SEO (Search Engine Optimization)**

This is a technique or a service by which the website of a company is displayed at the top of the search results when a keyword search is performed using a search engine.

- **Recommendation system**

This is a system that provides a service (i.e., recommendation) and displays the information in which a user may be interested, on the basis of the already registered purchase history of the user on the top page.

- **Long tail**

This is a concept where, by continuing with high-mix low-volume sales, a large profit can be achieved even when the sales quantity of each type of product is small. In certain cases, this indicates that it is impossible to ignore the ratio of the sales total of a product with poor sales in relation to the overall sales.

- **Internet advertising**

This is a collective term for corporate advertising on the Internet.

It includes **affiliate** (i.e., result-reward type advertisement) in which a company advertisement or a link to a website is posted on the web page of an individual and remuneration is paid according to the derived results; **opt-in mail advertisement** in which e-mails are sent to the persons who have given their consent to receiving

advertisements (i.e., opt-in mails); **banner advertisement** in which the link to a website is posted on a large portal site; **pop-up advertisement** that is displayed automatically in a separate window by adware; **interstitial advertisement** that is displayed on the search result page of a search site; and **listing advertisement** (i.e., keyword targeted advertisement) that is associated with a search keyword.

- **Escrow service**

This is a service in which a provider serves as a mediator between a seller and a buyer in a C to C form of service, such as an Internet auction.

- **Drop shipping**

This is a sales form in which, upon receiving an order for a product, the operator of a net shop contacts a wholesaler to send the product to the ordering person. This enables the operator of the net shop to perform sales without keeping an inventory of the product, and on the other hand, the wholesaler can assign the sales activity to the net shop.

3-3-2 EDI

EDI (Electronic Data Interchange) is a mechanism by which the data type and data format of business transactions, such as EC, are consolidated, and the quotations, acceptance and placement of orders, and payments are exchanged electronically between companies. The EDI that uses the Internet without the use of a leased line for the exchange of data between companies is called **Web-EDI**.

In the past, the data type and data format of EDI and the form of network connection was different in each industry in most of the cases, which made it difficult to convert a transaction to EDI. Thus, there have been ongoing standardization efforts mainly in the U.S. and Europe, and in the year 1988, the United Nations adopted **EDIFACT (EDI For Administration, Commerce and Transportation)** as an international standard protocol for EDI. In addition, standardization techniques, such as **XML-EDI** and **XBRL (eXtensible Business Reporting Language)** which are based on XML (eXtensible Markup Language), are incorporated as the data type or data format in which the Web browser is the standard interface, and standardization and open technology are being promoted beyond the industry and business type.

In EDI, the protocols are decided as described below, depending on the hierarchical level.

Convention	Content
Level 1 Information communication protocol	This is an agreement (i.e., communication protocol) concerning the type of line and the transmission control procedure, which is used to communicate information by using the network.

Level 2 Information representation protocol	This is an agreement concerning the rules of the message format and the representation method, which is used for proper exchange of information.
Level 3 Task operation protocol	This is an agreement concerning the system operation time and the countermeasures at the time of the occurrence of an error, which is used for exchange of information.
Level 4 Basic transaction protocol	This is an agreement concerning the transaction contract details and the contract, which is used to establish the legal validity of a transaction.

In addition to the above, the following protocols are also related to EDI.

- **JIS X 7011-1**

This is an electronic data interchange (EDIFACT) protocol for administration, business, and transportation.

- **JIS X 7012-1**

This is a syntax rule (i.e., CII syntax rule) for administration/industrial information interchange. It corresponds to the information representation protocol of level 2.

- **STEP (STandard for the Exchange of Product model data)**

This is a standard for the representation and exchange of the product data model that is defined by ISO.

- **Japanese Bankers Association protocol**

This is a standard (i.e., communication protocol) for the electronic banking system that is defined by the Japanese Bankers Association.

- **JCA (Japan Chain Stores Association) procedure**

This is a communication protocol defined by JCA.

3-3-3 Social Media

Social media refers to a website (or media) that promotes communication through posting or sharing of information between Internet users. It is a mechanism by which many users connect over the Internet, and information is propagated widely.

- **SNS (Social Networking Service)**

This is a closed user group service that provides the chance of communicating with friends and of becoming acquainted with new people on a community website for individuals. Currently, it is also being used as a place for companies to exchange

information, or as a place for communication between employees or between the company and its customers. A typical example of an SNS is Facebook which is a service that requires registration with one's real name.

- **Electronic bulletin board**

This is a website where members can freely post or browse through specific topics on the Internet.

- **Blog (Weblog)**

This is a website for posting information that can be set up easily by an individual on the Internet. It is also often used by companies as a place for reporting activities.

- **Mini-blog**

Although this is a website for posting information similar to a blog, information is posted in the form of short text on a mini-blog. A typical example of a mini-blog is Twitter, where daily tweets are posted.

- **Video sharing system**

This is a website where an individual can create and post a video to be viewed and listened to by an unspecified number of persons. A typical example of a video sharing system is YouTube. There is also a service that is used for the live broadcast of videos in place of text information as found on a mini-blog.

- **Chat**

This is a mechanism by which text information is shared between individuals in real time. Currently, it is being used for conversations between players during online games.

- **CGM (Consumer Generated Media)**

This is a collective term for media (or websites) used to accumulate information created and sent by a consumer in the database, and then post the information. SNS and blogs can also be referred to as consumer generated media. Since it plays the role of grapevine communication by publishing information (e.g., reviews) concerning products and services which is provided by consumers, it is considered to be part of the Share process of the net purchase model, which is referred to as AISAS (Attention, Interest, Search, Action, Share) according to the current marketing strategy. While there is a possibility of a major success from such consumer generated media, it is necessary to note that **stealth marketing** devised intentionally by a company leads to a major degradation of the image of the company from the viewpoint of morals.

3 - 4 Consumer Appliances and Industrial Devices

3-4-1 Embedded System

An **embedded system** is a small system that is embedded in home electric appliances or industrial products, and controls the device.

The typical hardware and software configuring an embedded system are of the following types.

- **Microprocessor (Microcomputer)**

This is a small processor (or small computer) that controls the embedded system. Generally, a dedicated **embedded OS** is used, but sometimes either a general OS may be used, or the hardware may be controlled directly by **embedded software** without the use of an OS.

- **Sensor**

This is a device that analyzes analog waveforms, which are measurement values, and performs A/D conversion which converts them into electrical signals by performing signal processing such as filtering.

Sensor name	Use
Optical sensor	This is a sensor that uses light.
Infrared sensor	This is a sensor that uses infrared rays.
Magnetic sensor	This is a sensor that uses magnetism.
Accelerator sensor	This is a sensor that measures changes in speed.
Gyro sensor	This is a sensor that measures the rotation speed and the rotation angle.
Ultrasonic sensor	This is a sensor that uses ultrasonic waves.

- **Actuator**

This is a device that performs D/A conversion that converts electrical signals into movements.

- **Firmware**

This is embedded software that is recorded in ROM to control the hardware. Although rewriting was not originally a prerequisite for this software, it is currently recorded on flash memory and may be rewritten after shipment.

- **System LSI**

This is a circuit in which the main electronic circuits of the embedded system are integrated into one chip.

- **MEMS (Micro-Electro-Mechanical Systems)**

This refers to micro-electro-mechanical elements of a few nanometer (10^{-9} meter) units, and their manufacturing technology. This is a device in which the sensors, actuators, and electronic circuits are integrated into one infrastructure, and it is also used in printer heads and electronic paper.

- **Seven-segment LED**

This is a device composed of seven segments. The ON/OFF process of each segment is controlled individually, and it corresponds to one bit. Therefore, numeric characters from 0 to 9 can be represented in seven-bit information.



When an event, such as turning ON/OFF of a switch or a reception of an electrical signal from the sensor, occurs in the basic embedded system, the actuator is controlled by performing signal processing.

For example, in a household air-conditioner, the signals (e.g., the temperature setting information) sent from the remote control are received by the air-conditioner. If there is a difference between the room temperature that is measured by the temperature sensor and the set temperature, a temperature adjustment signal is sent to the actuator to control the compressor.

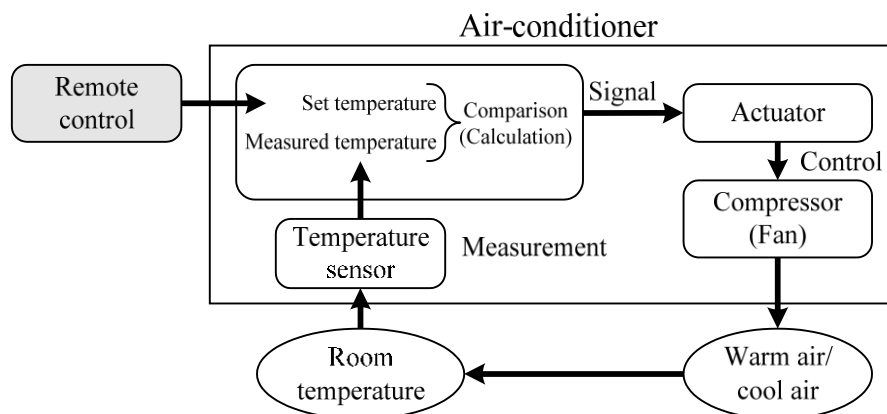


Figure 2-5 Air-conditioner control

An embedded system requires **real-time control** that poses strong restrictions to the response time. In a life-related **hard real-time system**, it is especially essential to use a **real-time OS** to ensure that the processing is completed within the expected time.

Such a control system for an embedded system includes the following types.

- **Feedback control**

This is a method of detecting the effect of disturbances (i.e., external factors disturbing the control) on the actual measured value, and then correcting the deviation from the desired value.

- **Feed-forward control**

This is a method of performing a corrective operation beforehand by predicting and estimating the disturbances.

- **Sequence control**

This is a method of gradually proceeding with control according to the predetermined procedure.

- **Multivariable control**

This is a method of determining several information items to be controlled in an integrated manner, and then controlling each item.

- **Fuzzy control**

This is a control method for an ambiguous status, such as “a somewhat large number,” “slightly.”

- **PWM (Pulse Width Modulation) control**

This is a method of performing control by changing the pulse according to the input signal in a fixed cycle.

A method by which the result (i.e., output) is reflected in the next control process, such as in feedback control, is called **closed loop control**. A method by which the result is not reflected in the control process, such as in feed-forward control and sequence control, is called **open loop control**. Whether these controls are being performed properly can be verified by testing the response characteristics and the control stability through a diagnostic program.

3-4-2 Consumer Appliances

A **consumer appliance** is a household electrical appliance or computer-associated equipment for the general consumer. It may also include job-oriented equipment (e.g., POS register) used by individuals.

In modern society, computers (or embedded systems) are incorporated into a wide range of products. These computers cooperate mutually to achieve **ubiquitous computing** that supports our daily lives. In addition, consumer appliances are being made smaller and lighter, and privately owned (i.e., personalized) information devices and **wearable computers** that can be worn on the body and carried around are becoming the norm. Wearable computers have become the basic technology of ubiquitous computing by being combined with a **sensor network**, which is a wireless network for extracting data by connecting together several terminals equipped with a sensor. In such a situation, interactivity (i.e., bidirectionality) over the network is now being required more than ever before.

(1) AV (Audio and Visual) system

AV system is a collective term for devices that handle video images and music. Most AV systems are loaded with a large volume storage optical disc, such as CD, DVD, or Blu-ray disc.

- **Stereo**

The majority of current stereos can handle digital data. Optical discs such as CDs, DVDs and Blu-ray discs are used as content storage media.

- **Portable headphone stereo**

From the initial cassette tapes through CDs and DVDs, currently mainstream headphone stereos use semiconductor memory, such as flash memory. Products that are linked with the Internet, such as the Apple iPod that enables music contents to be acquired through the Internet, are also available in the market in large numbers.

- **Television**

While conventional televisions made use of a computer in part of the control circuit, televisions that support digital broadcasting include products in which bidirectional communication and the Internet can be used, and computers are now playing the main role of a TV. Moreover, the screen also has moved on from a cathode ray tube to liquid crystal and plasma types.

- **Picture recorder**

The use of video tapes (i.e., a type of magnetic tape) for recording pictures was prevalent in the past, but recently, recording data is being digitalized so that it can be handled in computers as well, and products in which recording can be performed on a hard disk drive or an optical disc are becoming popular. Recording picture data in a digital format (e.g., MPEG) has the advantage that the recorded data does not deteriorate, but problems relating to copyright and reproduction are becoming an issue.

(2) Household electrical appliances

Household electrical appliances is a collective term for the equipment that exists around us, such as air-conditioners, refrigerators, washing machines, electric rice cookers, and microwave ovens. An embedded system is used to control these household electrical appliances. Some household electrical appliances can be operated from a remote place when connected to the Internet. In particular, devices that support **DLNA (Digital Living Network Alliance)**, which is an industry specification for a home LAN, and automatically becomes usable when it is connected to the network. Household electrical appliances that possess the functions of a computer are referred to as **digital household electrical appliances** or **information household electrical appliances**.

(3) Personal information equipment

Personal information equipment is a collective term for PCs and PDAs (Personal Digital Assistants), smartphones and cellphones, or tablet terminals. Among these, devices that possess a communication function are also referred to as **consumer communications terminals**. In particular, products that significantly improve the performance and the functions of cellphones and smartphones, and support the music playback function and digital terrestrial broadcasting (**ISDB-T (Integrated Service Digital Broadcasting-Terrestrial)**) called **one seg** (whose formal name is one segment reception service for cellphones and mobile terminals) are also available.

(4) Education and entertainment devices

Computers have long been used as **education and entertainment devices**. For instance, the gaming machine known as the “Family Computer” that was launched by Nintendo in 1983 is a representative example. The most recent gaming machines surpass computers in their performance, and some recent gaming machines even use high-performance processors. Moreover, these machines are used not only for entertainment, but can be purchased with software for other purposes including dictionaries and learning, cooking recipes, and health management.

(5) Computer peripherals / OA equipment

Computer peripherals is a collective term for equipment, such as displays, printers, and image scanners. On the other hand, **OA equipment** is the collective term for the copiers and facsimile machines used in offices, which are now also commonly being used in households. These devices include an increasing number of products that can be connected to the network, and the construction of a **home network** (i.e., home LAN) is also becoming common.

(6) Job-oriented terminal devices

A **job-oriented terminal device** is a terminal device connected to a system like a POS terminal of a convenience store, or a credit card reader used in shops.

3-4-3 Industrial Devices

Industrial devices refers to job-oriented devices used in companies and organizations. As with consumer appliances, an embedded system is used in most industrial devices.

In industrial devices, detailed analysis, measurements, and control are performed by an embedded system to promote labor-saving and automation. Moreover, industrial devices are also required to possess interactivity (i.e., bidirectionality) over the network.

- **Communication equipment**

This is a collective term for network devices, wireless communication devices, and public phone line equipment. Typical examples of communication equipment include routers and switching hubs used in networks, and digital switching facilities of telephone lines.

- **Transportation equipment and construction equipment**

Transportation equipment includes vehicles, railways, and airplanes, and construction equipment includes construction material processing machines in addition to large equipment, such as cranes. A malfunction of this kind of equipment can lead to accidents or loss of life. Therefore, both hardware and software are required to be of high quality and high reliability, and a failsafe design is incorporated.

- **Industrial control devices, FA equipment, and processing devices**

This refers to devices used in the engineering system, such as industrial robots. The computer control of production lines and assembly robots of large factories, processing devices, and automated warehouses are widely becoming standard at the existing industrial product manufacturing sites.

- **Equipment**

This refers to the air-conditioners and devices for management and security protection of the entrance and the exit used in buildings and factories. This equipment is managed in a consolidated manner by a central management center, and most of the equipment is controlled by a dedicated computer. For example, the security protection system performs consolidated management of the security of the overall building and disaster prevention equipment, and is connected with the police station and the security company through a dedicated network to be able to communicate immediately in case of an emergency.

- **Medical devices**

This refers to devices used in medical treatment, such as patient monitoring equipment. As a result of the development in computers and technology, the performance and the functionality have improved exponentially. Since medical devices are directly related to life, they are required to have a high quality, high reliability, and a failsafe design.

- **Analytical instruments and measuring instruments**

As a result of the development in computers and technology, the performance and the functionality of analytical instruments and measuring instruments have also improved exponentially. These instruments are indispensable not only in the industrial field but also for constructing an advanced disaster information system, such as AMeDAS of the Japan Meteorological Agency and a seismic observation system.

- **Other devices**

Various automatic vending machines and ATMs (Automated Teller Machines) are also examples of industrial devices.

Chapter 2 Exercises

Q1

Which of the following is an appropriate explanation of core competence?

- a) It is a technological innovation that promotes the growth of a company by foraying into new fields.
- b) It is the fundamental spirit and action guideline of management activities.
- c) It is the position of a company in the market that is decided through the quality and quantity of management resources.
- d) It is a management resource that acts as the source of differentiation from other companies.

Q2

Which of the following is a description of OEM that is a form of tie-up between companies?

- a) Technological tie-up
- b) Capital tie-up
- c) Production tie-up
- d) Sales tie-up

Q3

Which of the following is an explanation of “Star” in the context of PPM (Product Portfolio Management)?

- a) It indicates products that have a high market growth rate and a high market share. These products require heavy investments to grow, so the money creation effect is not necessarily large.
- b) It indicates products with a low market growth rate and a low market share. The money creation effect is small, and the amount of cash flow is also small.
- c) It indicates products with a high market growth rate and a low market share. Although long-term possibilities can be expected, the extent of the money creation effect is not known.
- d) It indicates products that have a low market growth rate and a high market share. These products have a large money creation effect, and act as the support for a company by being the source of capital.

Q4

Which of the following is a technique for analyzing the superior points, inferior points, advantageous factors, and disadvantageous factors of a company in order to develop a business strategy?

- a) SWOT analysis
- b) Competitive position analysis
- c) Growth matrix analysis
- d) Value chain analysis

Q5

Which of the following is an explanation of marketing mix?

- a) It is a purchase model of the customer, and is composed of attention, interest, desire, memory, and action.
- b) It is a standard for classifying customers, and is composed of the last purchase date, purchase frequency, and total purchase money.
- c) It is an analysis perspectives of the business environment, and is composed of customer, competitor, and company.
- d) It is a means of satisfying the market needs, and is composed of product, price, place, and sales promotion.

Q6

Which of the following is a marketing technique of approaching all customers simultaneously by using advertising media, such as television and magazines?

- a) Segment marketing
- b) Test marketing
- c) Mass marketing
- d) One-to-one marketing

Q7

Which of the following is an appropriate explanation of CSF?

- a) It is an important performance indicator for evaluating the means of achievement of strategic objectives.
- b) It is an important goal indicator for evaluating the level of achievement of strategic

objectives.

- c) It is an important factor of the success for achievement of strategic objectives.
- d) It is overall quality management by which quality management is applied to the business strategy.

Q8

Which of the following is a purpose of CRM?

- a) An improvement in the efficiency of sales activities and an increase in sales and profits
- b) Acquisition of customer loyalty and maximization of lifetime value of customers
- c) A reduction in sales opportunity loss because of insufficient inventory
- d) An effective utilization of management resources by integrated management

Q9

Which of the following is management that invests in technology development in order to promote innovation, and expands the growth of the company?

- a) M&A b) MOT c) R&D d) TLO

Q10

Which of the following is a technique that records the sales information when a product is sold in a shop, and collects, stores, and manages the product sales information per piece of the product?

- a) EOS b) PHR c) POS d) XBRL

Q11

Which of the following is an appropriate description of a production system?

- a) In a cell production system, a single operator or several operators are in charge of all processes.

- b) In a process production system, the required products are produced at the required time and only in the required quantity.
- c) In a build-to-stock production system, the production of a product is started after an order is received from a customer.
- d) A continuous production system is suitable for a high-mix low-volume production.

Q12

Which of the following is a system which configures FA that performs the design and the drafting task in an interactive and automatic manner by using a graphic display or an automatic drafting machine?

- a) CAD
- b) CAE
- c) CAM
- d) CAT

Q13

Which of the following is a “B to C” form of transaction in EC (Electronic Commerce)?

- a) e-marketplace
- b) Online mall
- c) Electronic auction
- d) Electronic procurement system

Q14

Which of the following is an appropriate explanation of the affiliate that is a type of Internet advertising?

- a) It is a software-driven advertisement that is displayed automatically by adware.
- b) It is a search-driven advertisement that is displayed in association with a search keyword.
- c) It is an e-mail advertisement that is sent to the persons who have given their consent to receiving advertisements.
- d) It is a result-reward type advertisement in which remuneration is paid according to the derived results.

Q15

Which of the following is defined in the information representation protocol for EDI implementation?

- a) Contract details for transactions between companies
- b) System operating hours
- c) Transmission control procedure
- d) Message format

Q16

Which of the following is an appropriate case example of feedback control?

- a) When the room temperature becomes higher than the set temperature, the cold blast function of the air-conditioner is activated automatically to bring down the room temperature to the set temperature.
- b) When an automatic dishwasher switch is pressed after dishes are loaded, the operation is performed in order of washing, rinsing, and drying.
- c) A washing machine automatically adjusts the amount of detergent and the washing time by detecting the level of soiling as “very dirty” or “slightly dirty.”
- d) If a timer is set, the amount of hot water is adjusted and the water heating function is activated so that the hot water in the bath tub reaches the appropriate volume within the set time.

Q17

Which of the following is an industry specification for a home LAN that is used in household electrical appliances?

- a) ATM
- b) DLNA
- c) ISDB-T
- d) PDA