Introduction

1 Computers and Information Society

The society in which we live today is sometimes called the “Information Society” or the “Information Processing Society.” This “Information Society” is one in which people need to create or locate, from among a flood of data, the information that is beneficial to themselves. Such an explanation may prompt the question of what is the difference between data and information. Data and information are, in fact, entirely separate things. Looking up each in the dictionary reveals the following descriptions.

Data = “Material that forms the basis for debate or research”

Information = “Reports of circumstances or conditions that are beneficial to some person”

An example may help make the difference clear.
The numeric string “20080607” is considered here. This numeric string is simply a meaningless listing of numerals as it is. (This is an example of data.) However, when “20080607” is interpreted as the “07”-th day of the “06”-th month of the year “2008”, the string comes to have a meaning, such as a “date of birth.” In this manner, data that holds meaning is called “information.” In other words, “data” becomes “information” when it comes to hold meaning.

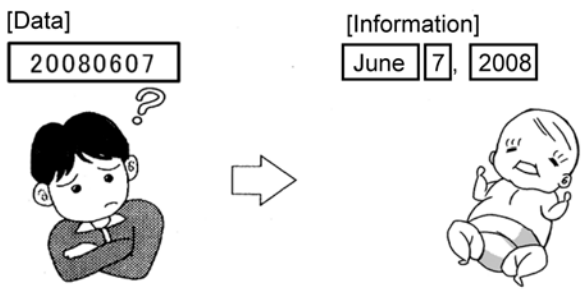


Figure I　The difference between data and information

What is important here is correctly interpreting “data” as “information.”
For example, the numeric string that is interpreted above as a birthday could actually be the “phone number” “2008” - “0607”, or could be a “product sales record” that tells us that “product number” “200”, at “80” dollars per unit, sold “607” units. In other words, “data” can become entirely different “information,” depending on how it is interpreted. Correctly and quickly processing data is important. The tool necessary for doing so is the “computer.”

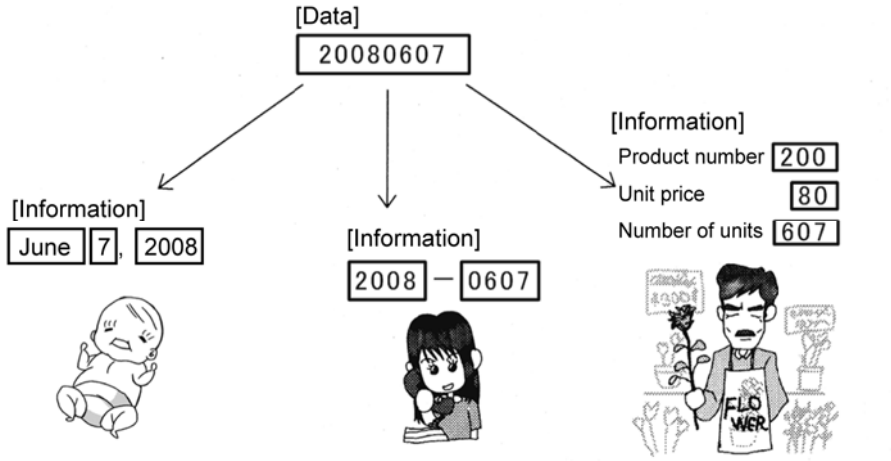


Figure II　Data can be interpreted in many ways

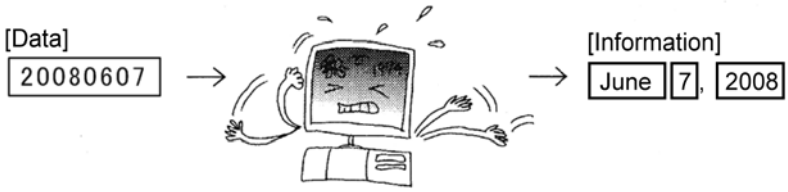


Figure III　The computer is a tool for quickly obtaining correct information

2 Computers Within Society

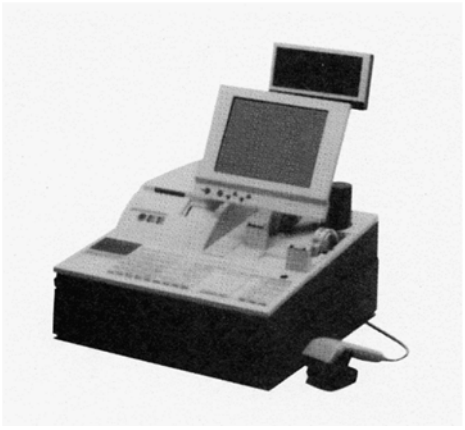
The following examples describe how computers are actually used in society.

(1) POS system

POS (Point Of Sales) system is a system for managing information at the point of sales. While the idea may seem complex, the system has become familiar to most people.

When one buys something at a super store or a convenience store, a machine beeps when the product bar code is scanned and read. This device is the "barcode reader" that enters product data into a POS system. A barcode, which appears as a group of lines affixed to a product, represents a variety of information through the thickness and spacing of the lines. The role of "POS system" is to read this information, analyze factors such as what products are selling, and determine the number of products that are purchased.

Bar code



POS system terminal

Barcode reader

(2) ATM system

In a bank, there is a machine that allows the use of a card or a passbook to withdraw cash or check account balances. Users insert a card or a passbook into the machines, and enter instructions for making deposits or withdrawals along with the monetary value, or issue instructions to check account balances. The processes (e.g., the cash withdrawal) are then carried out on the basis of the personal information (e.g., the account balance) that is registered with the bank. If money is withdrawn, the amount withdrawn must be subtracted from the account balance at the same time. "ATM system" allows this process to take place without inconsistencies. This system greatly enhances convenience, by letting customers withdraw money from banks other than the one holding the deposit, and by eliminating the need to queue at a bank counter.

ATM system

(3) Seat reservation system

A seat reservation system is used to secure a variety of reservations, ranging from a seat for a high-speed train or an airplane to a ticket for a concert or an event. Before this kind of system is created, workers had to perform reservation tasks manually. Reservations had to be performed at specified locations, which caused queues from early hours and troubles such as duplicate reservations for the same seats. The description may sound unbelievable to people who have only used modern reservation systems.

Seat reservation system

(4) The Internet

It would be difficult to imagine anyone who does not know about "the Internet" today. Computer is used as a terminal for connecting to "the Internet." Computer is also used in the administration and operation of "the Internet." The Internet could truly be called a system representative of today's information society.

"Actions that people can perform through use of the Internet" can be broadly divided into "information search/transmission" and "online shopping."

[Information search/transmission]

This refers to the search for information that people want to know (i.e., search), and the release of information that people want to be learned by others (i.e., transmission). Today there are numerous search engines (i.e., tools to aid in investigating information), and countless websites that range from individuals to companies.

An example of a website

[Online shopping]

This refers to the use of the Internet for shopping. At present, many companies sell their products via their own websites. There are also many virtual stores and shopping malls that sell products only on the Internet, without brick-and-mortar stores. Payments through credit cards and online banking have become increasingly common payment methods, as an environment has been prepared for convenient shopping from home.

An example of online shopping

3 The World Surrounding Computers, and the Structure of this Textbook

Today, since computers perform a variety of jobs, the world is becoming increasingly connected around computers. The world surrounding computers today is composed of three broadly divided structural components as shown in Figure IV.

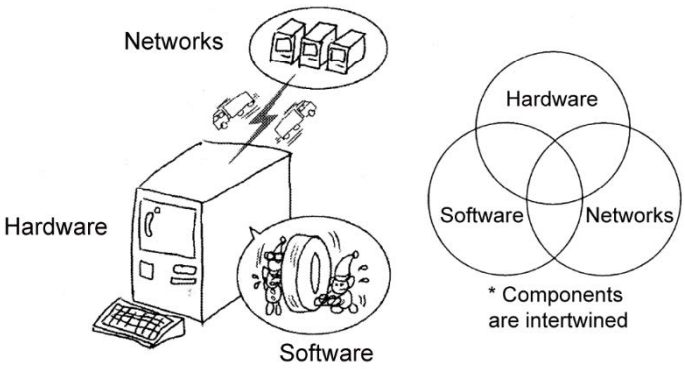


Figure IV Structure of the computing world

The following detailed discussion uses POS system that is introduced in the previous section "2 Computers Within Society" as an example.

(1) Hardware

This is the mechanical component that makes up computers. Hardware technology has seen dramatic advances in recent years, which results in creating a succession of achievements thought impossible until now. The decrease in the cost of hardware is also a major factor behind today's proliferation of computers.

In a POS system, the "barcode reader" that is used to read the bar codes on products is one component of hardware. The bar codes are read optically by lasers. You will be able to learn about such hardware mechanisms in "Chapter 1 Hardware."

The read information is not processed by the POS system terminal in the store. Instead, it is sent to and processed by a large scale computer in the head office. This form of processing is called "online transaction processing." Today, various types of data are generated, and each type of data is processed in a variety of form. When computers break down, the resulting impact is often large and widespread. For that reason, the most appropriate form of processing must be considered, with factors such as reliability in mind. You will be able to learn the knowledge required to do so in "Chapter 2 Information Processing System."

(2) Software

This is the component of a computer that instructs the computer to perform activity. Computers cannot act under their own discretion, without instruction by humans. The creation of documents, the exchange of e-mails, and such other function that are made possible by using computers is due to software that performs the processing.

A POS system carries out processes that include “Read bar code,” “Record data,” and “Calculate monetary amount.” In order to perform the processing, commands are issued to the hardware. (For example, the command “Read in the product bar code” is issued to a barcode reader.) Issuing these commands is the role of software. You will be able to learn about the mechanisms by which software issues orders, and ways by which resources are used efficiently, in “Chapter 3 Software.” Also, you can learn about “databases,” a means of managing and using data, in “Chapter 4 Database.”

In actual processing, it is possible to check the names or unit prices of products on the basis of the data contained in product codes, as an example. In order to do so, it is necessary to think of efficient procedures for finding the target product codes from among many codes. There is a close relationship between these procedures and the structure used to record data. You will be able to learn about data structures and processing procedures in “Chapter 7 Data Structure and Algorithm.”

(3) Network

Network is technology for exchanging information among computers. The rapid growth of computers in recent years can be seen as a result of the rapid growth in networks. This is because jobs that once could not be performed on computers now can be, because of the exchange of information among many computers.

In a POS system, data read at the store is transmitted for processing by large scale computers in the head office. Accurate and rapid transmission of the data requires knowledge of what methods and procedures to use in transmission. You will be able to learn basic knowledge about such communications in “Chapter 5 Network.”

In order to combine the above (1) through (3) and perform a variety of activities accurately, rapidly, and securely, a variety of “systems” are created (with the POS system being one such example). However, we cannot use such systems, nor use data that is used on networks such as the Internet, with assurance if these are not properly and securely managed. In response, a variety of network technologies are employed to enable the secure use of systems and networks. You will be able to learn about the concepts of information security management that are used in these security technologies in “Chapter 6 Security.”

4 The Relationship Between the ITEE and this Textbook

The ITEE (Information Technology Engineers Examination) is a national examination that is implemented by the IPA (Information Technology Promotion Agency, Japan) as one index for the training of human resources in the information processing industry. Under a 2008 revision to the examination system, the ITEE has been mapped to Levels 1 through 3 of the Common Career/Skills Framework, with level determined upon success in the examination.

Level	Name of examination	Targeted human resources
Level 1	IT Passport Examination	Persons with basic knowledge of the information technology that should be common to professionals
Level 2	Fundamental Information Technology Engineer Examination	Persons who possess the necessary basic knowledge and skills for becoming advanced IT professionals, and also have acquired practical capabilities for using them
Level 3	Applied Information Technology Engineer Examination	Persons who possess the necessary applied knowledge and skills, and also have established a direction, for becoming advanced IT professionals

This textbook is structured to allow learning in technology related fields within the scope of the morning questions in the Fundamental Information Technology Engineer Examination of the ITEE. The following table shows the correspondence relationship between the chapters of this textbook and the question areas of the Fundamental Information Technology Engineer Examination.

IT Fundamentals		Question areas of the Fundamental Information Technology Engineer Examination
Chapter 1	Hardware	1 Basic Theory (Basic Theory [Discrete Mathematics, etc.])
		2 Computer System (Computer Component)
		2 Computer System (Hardware)
Chapter 2	Information Processing System	2 Computer System (System Component)
		3 Technology Element (Human Interface)
		3 Technology Element (Multimedia)
Chapter 3	Software	2 Computer System (Software)
Chapter 4	Database	3 Technology Element (Database)

Chapter 5	Network	3 Technology Element (Network)
Chapter 6	Security	3 Technology Element (Security)
Chapter 7	Data Structure and Algorithm	1 Basic Theory (Algorithm and Programming)

Areas that are within the scope of morning questions but that are not covered in this textbook can be studied in another textbook “IT Strategy and Management.”
The following table shows the correspondence relationship between the chapters of “IT Strategy and Management” and the question areas of the Fundamental Information Technology Engineer Examination.

IT Strategy and Management		Question areas of the Fundamental Information Technology Engineer Examination
Chapter 1	Corporate and Legal Affairs	1 Basic Theory (Basic Theory [Applied Mathematics, etc.])
		9 Corporate and Legal Affairs (Corporate Activities)
		9 Corporate and Legal Affairs (Legal Affairs)
Chapter 2	Business Strategy	8 Business Strategy (Business Strategy Management)
		8 Business Strategy (Technological Strategy Management)
		8 Business Strategy (Business Industry)
Chapter 3	Information Systems Strategy	7 System Strategy (System Strategy)
		7 System Strategy (System Planning)
Chapter 4	Development Technology	4 Development Technology (System Development Technology)
		4 Development Technology (Software Development Management Techniques)
Chapter 5	Project Management	5 Project Management (Project Management)
Chapter 6	Service Management	6 Service Management (Service Management)
Chapter 7	System Audit and Internal Control	6 Service Management (System Audit)

This textbook is organized, as noted above, so as to allow mastery of the morning questions of the Fundamental Information Technology Engineer Examination, when used together with “IT Strategy and Management.”

Moreover, since this textbook corresponds to Level 2 of the Common Career/Skills Framework, its study contents include the question areas of the Level 1 IT Passport Examination. The IT Passport Examination is an examination for all who have acquired the fundamental knowledge required of persons using IT.

With the use of this textbook and “IT Strategy and Management,” it is possible to take the IT Passport Examination and the Fundamental Information Technology Engineer Examination in order. We hope that this textbook will be of use in improving the reader’s skills, with the aim of acquiring the desired qualifications.

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