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PERSONAL INFORMATION SYSTEM

by

LEONARD L. KO

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Approvals

Advisor: Professor James Sias

Date: 1 September 1993

Associate Advisor: Professor Robert Keough

Date: 9-1-93

Associate Advisor: Associate Professor Douglas Cleminshaw

Date: 93 SEp 2

Chairman of Industrial, Interior & Packaging Design: Professor Toby Thompson

Date: 9/2/93

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Date: 2 September 1993

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Chapter 1

Introduction

Have you seen a businessperson carrying a briefcase of business documents and trying to catch a flight? What if, unfortunately, his briefcase fell on the floor and the papers spread out from his briefcase? What an embarrassing situation! It might happen to any of us.

None of us wants to experience the embarrassing moment as I have described above. Some of us would buy a nice briefcase or a cart to make moving easier. For an industrial designer, it is only a temporary solution. The problem still exists when the briefcase becomes heavy as you need more documents. So I decided to establish a system for those who need to get large quantities of information in a short period of time, such as travelers, businesspersons, and students, and to make their jobs easier and more efficient.

In the following chapters, I would like to explain the four forms and four functions of information. This will help us to better understand information itself. I am also going to describe the current environment and some changes which are going to happen in our schools and offices as well.

We need to know what our technologies can do for us before we establish this personal information system. We also need to know something

about information itself. This knowledge will guide us in the right direction on this design project.

In the last three chapters, I will address the design development, product components, and some expectations of this product.

Chapter 2

Something about "Information"

Before we talk about information technologies and people's needs, we should know something about "information." In the following sections, I will introduce four forms and four functions of information.

2.1 Four forms of information

The forms of information, data, text, sound, and image,[1] are all mental impressions that we receive through our senses, sight, and hearing. These two senses are the most important senses for us in this age. I believe that the other senses, such as taste, touch, and smell, may become more important in the future, but for now we still focus on the first two senses I have mentioned. Because we have already developed sight and sound commercial applications and used them for many decades, we are now confident with those applications.

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1. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.24.

2.1.1 Data

Data are, all the facts, numbers, letters, symbols, and the like, that can be processed or produced by computers.[2] It does not mean that data only exists in computers, however, the computer does handle data very well no matter what form it comes in. Texts, sounds, and images can be reduced to the raw bits of "0"s and "1"s in computers and be processed efficiently.

2.1.2 Text

Text is written language, one form of sound. It may be written by hand or printed by machine. Even though handwritten words do not have the consistency that printers do, the current technology has already made the machine able to read the handwritten form and translate it into the printed form.

2.1.3 Sound

Sound is what we hear. It is also the easiest way for most of our communication. Through the sound of voice or music, we can express our thoughts and feelings. Sound is not like text because it is temporary. Our technology allows us to catch and keep it with tapes and CDs (compact disc).

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2. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.25.

2.1.4 Images

Images are visual forms. They may be paintings, photographs, or printed matter. Images can be transferred by fax, copier, printer, and scanner. We also can create images with computers even though those images do not exist in the real world. You can see the image completely surrounding you. As you move your head, you see different parts of it, just like in the real world. You can walk around it, into different rooms or chambers. You can even use your hands to pick things up and move them from place to place. No longer do people need a keyboard or mouse. We call this technology "Virtual Reality," one of the hottest topics in the latest technologies.

Sometimes, a form can be transformed to a different form. For example, text , images, and sound can be translated to data bits in computers. Using this relationship, scientists and industries are involved in finding out the linking technologies among and across those forms. Companies, such as AT&T, IBM, CBS, Kodak, and Xerox, are already interested in this research. They realize that they are in related and competing businesses.[3]

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3. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.27.

2.2 Four functions of information

I have explained the four forms of information. The next thing that should be considered is how people can work with information. People can basically do four things with information: generate it, process it, store it, and transmit it.[4] These four functions have already been done effectively with machines today.

In addition, applying information to a task is also an important function for us. I shall not describe this function in this thesis report because it is not strongly related to the system that I am going to establish. In the following sections, we will focus on the four functions of information, which are generation, processing, storage, and transmission.

2.2.1 Generation

Generation does not refer to creating new information but preparing information to be sent.[5] It means that information needs to be ready for the sending process anytime. The information may be sent in the form of data, text, sound, or images.

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4. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.27.

5. Ibid., p.28 .

2.2.2 Processing

After the information is prepared, users may want to retrieve a little part of it. To process the information becomes important at that time. This function includes converting, editing, analyzing, computing, and synthesizing information. If an information system has a great ability to process its information, it can save its users' time and energy.

2.2.3 Storage

The third function is keeping the information for later use. Storage in the electronic age, however, is dynamic because the storage mechanism is also a processor. A word processor, for example, stores your writing and also lets you retrieve and change it. Storage is not only being a "memory bank" but also having an ability to organize information. It will make it easier for users to get information later. "Storage is not only about space but also making the function active today."[6] The activity of this function is that users can easily find, use, change, and update their information.

2.2.4 Transmission

Besides the three functions above, transmission is the forth function that I

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6. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.29.

would like to expand. Transmission includes many activities, such as display, collection, switching, reception, networking, broadcasting, and signal processing.[7] It is also about the media and interface design.

Based on these four functions, information becomes more active. In the last few years, computers have dominated the generation, processing, and storage of information, and telecommunications have excelled in transmissions. Today, scientists and engineers are working hard to make these functions more powerful and work better with each other.

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7. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.29.

Chapter 3

Explanation of the State of the Art

Quick and accurate information in this age is the desire of human beings. Improving the related technology is the best way to satisfy themselves. Before starting concept development, we should find out what technologies can and cannot do. In the following sections, technical information will give us some ideas about the the current status of information technology.

3.1 Text-speech translation

Information is mostly passed within the four forms described in the last chapter. For human beings, text, sound, and images are the most familiar communication channels. Can these three forms be linked to each other? This question has interested many scientists and engineers in the past few decades.

While we are enjoying the fruits of the information technology, some people are not benefiting as we do. They are the deaf and the blind. If text and speech can freely be translated to each other, it would give a lot of assistance to these people. Additionally, the translating technology will make many present products easier to use for they will be able to have multi-input/outputs.

Currently, text-speech translation is composed of three parts: "text to speech" function, "speech to text" function, and a "Vocabulary Expert System."

3.1.1 From Text to Speech

First of all, speech synthesis technology has already been used. Current "text to speech synthesis systems" are set up as the outline shown in Fig.1.[8] According to a report "Speech Synthesis from Text" (Yoshinori Sagisaka, 1990)[9], improving the quality of the speech output is the concern point.

To generate the primitive control information needed to produce synthesized speech from a given text requires text analysis. To produce quality speech output, pronunciation dictionaries, and grammatical dictionaries are needed. The information consists of phonetic information and prosodic[10] information. The phonetic and prosodic information roughly corresponds to pronunciation symbols and accent marks.

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8. Yoshinori Sagisaka, "Speech Synthesis from Text," IEEE Communications Magazine, (January, 1990), p.35.

9. Ibid., p.35-41.

10. prosodic: "of or relating to suprasegmental phonemes which are the phonemes (as pitch, stress, juncture, nasalization, voice, or voicelessness in clusters) of a language that occur simultaneously with a succession of segmental phonemes." - Webster's Third New International Dictionary, (Springfield, Massachusetts: Merriam-Webster Inc., 1986), p.1821, 2299.

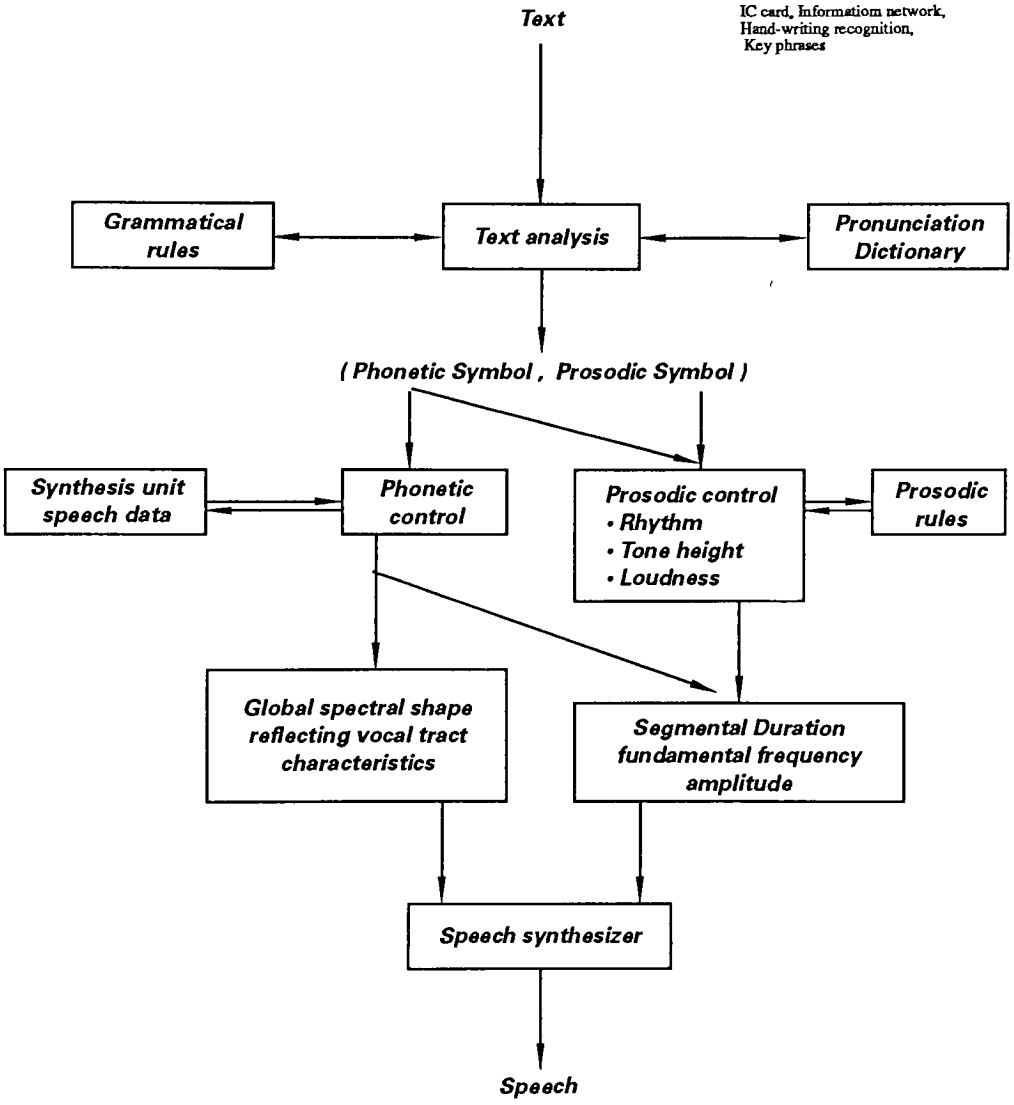

Fig. 1 Speech synthesis from text model

In the next step, phonetic symbols are modified slightly to adapt word pronunciation to sentence pronunciation using phonetic rules. Without knowledge or experience of hearing or speaking the language, this system needs to have the prosodic control to control language-specific rhythm, tone height, and loudness. The prosodic rules are applied to produce the temporal organization of the speech (segmental durations), its accent, and intonation characteristics (fundamental frequencies). Speech waveform is produced by using these control factors. Using speech synthesis units and a set of rules, the phonetic symbols are transformed into sound. Prosodic data, such as segmental durations and fundamental frequencies are used to determine temporal structure and to control the vocal cord characteristics.[11]

There is one thing additional that we have to consider. Languages, such as English, French, Spanish, and Japanese, are pronounced by a few certain letters. For example, pronunciation is based on 26 different letters in English and about 50 in Japanese. But languages such as Chinese have more than five thousand different characters. Some of those characters have two or more ways to be pronounced. It is difficult to build a speech output system for Chinese. I believe that the improvement in our computer programming and micro-electronic technologies will open a wide door for us soon. Larger

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11. Yoshinori Sagisaka, "Speech Synthesis from Text," IEEE Communications Magazine, (January, 1990), p.35.

vocabulary expert systems and super computer processors may solve this problem.

3.1.2 From Speech to Text

In the last decade of the twentieth century, it is clear that speech technology, in partnership with digital computing, is providing new ways and new capabilities for people to manage and communicate information.

Speaker recognition can be performed on a known text or "password". According to a research paper written by Naftali Z. Tishby, 1991[12], Hidden Markov models (HMMs), when trained properly, can be used for statistically characterizing speakers in a text-independent manner. Can computers translate a natural language into text? The outline in Fig.2[13] shows how computers can do the word-by-word translation (mechanical dictionary) basing on this model. In this process, a computer has to digitalize the speaker's speech and compare it with the vocabulary and grammar model in a speech

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12. Naftali Z. Tishby, "On-line Application of Mixture AR Hidden Markov Models to Text Independent Speaker Recognition," IEEE Transaction on Signal Processing, (March, 1991), p.563.

13. James L. Flanagan, "Speech Technology and Computing: A Unique Partner," IEEE Communications Magazine, (May, 1992), p.85.

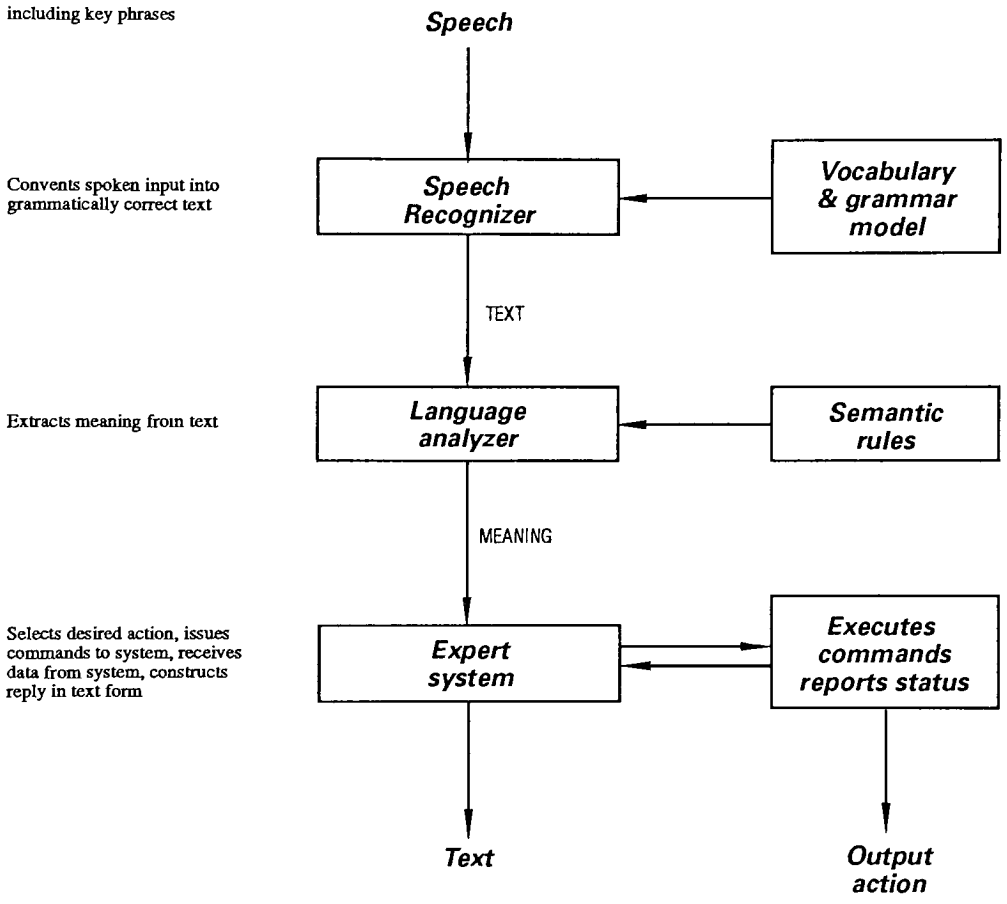

Fig. 2 Translating speech to text model

recognizer. The computer may not totally understand the speech. Then it will analyze the text output which comes from the speech recognizer, organize it, and lay out the meaning. The meaning will be input into an expert system and the system will send the output to users in text form or action.

When a speaker gives a speech to a computer, it is spoken with emotion which is affected by the environment or other effects. Unlike a human being, a computer cannot analyze the speech with the speaker's emotion or other factors. The computer will miss some key words or misunderstand the true meaning. In addition to this problem, I can imagine that it is more difficult to translate a Chinese speech into text output because many characters have two or more ways to be pronounced and some characters have the same pronunciation in Chinese. Hubert L. Dreyfus in his book "What Computers Still Can't Do"[14] classified the "Intelligent Activities" into four classes: associationistic[15], simple-formal, complex-formal, and non-formed. In the book,

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14. Hubert L. Dreyfus, What computers Still Can't Do, (Cambridge, Massachusetts: The MIT Press, 1992) p.292.

15. Ibid., "Associationistic class" includes all forms of elementary associationistic behavior where meaning and context are irrelevant to the activity concerned. It is learned by repetition. Its activities include memory games, maze problems, word-by-word translation, and response to rigid patterns.

word-by-word translation is included in the associationistic class and translating natural language is classified in the non-formed class. Computers have already done a good job in the associationistic and simple-formal classes but have to improve their ability in doing the complex-formal and non-formed classes. He believes that computers will do better through the improvement of the software programming techniques or changing the system design concepts.

3.1.3 Vocabulary expert system

The vocabulary expert system is the spirit of the speech-text translation system. It is a large data-based system, including a pronunciation dictionary and vocabulary model. The technology of "Large-vocabulary phoneme recognition" was developed in 1989.[16] This technology has already been applied to the electrical dictionary, electrical encyclopedia, and some educational products..

3.2 Hand-writing recognition

Hand-writing recognition can be classified as "On-line" and "Off-line" recognizing methods.

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16. James L. Flanagan, "Speech Technology and Computing: A Unique Partner," IEEE Communications Magazine, (May, 1992), p.84.

"Off-line" hand-writing recognition is performed after the writing is completed. An optical scanner converts the image of the writing into a bit pattern. This technique cannot use any dynamic writing information: the number of strokes, the order of strokes, and the direction of stroke creation.[17]

"On-line" hand-writing recognition means that a machine recognizes each character while it is being written. The preferred input device is an electronic tablet with a stylus pen.

On-line recognition has two major technological advantage over off-line recognition. The first one is high-recognition accuracy because it captures a character as a set of strokes. The second one is interaction because it is very natural for the user to delete or correct mis-recognized characters on the spot by verifying the recognition results as they appear.[18]

The On-line technology can be used for recognizing Japanese and Chinese because of its advantages. Their characters can be written with wide variations in the number and order of strokes and significant shape distortions.

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17. Toru Wakahara, Hiroshi Murase and Kazumi Odaka, "On-line Handwriting Recognition," Processings of The IEEE, (July, 1992), p.1181.

18. Ibid., p.1182.

3.3 Telecommunication technology

When people are talking about transmitting information, telecommunication technology is one of the most important factors affecting this function. In this section, some new products will give you ideas about how telecommunication technology is doing.

- In the first half of 1993, AT&T introduced their "Personal Communicators" which will combine fax, cellular modems and phones, pagers, electronic mail, and a computer.[19]
- In the second half of 1993, a "Smart phone" will be introduced by AT&T. It will offer a touch-sensitive display screen. It can help users to balance their banking account, pay the phone bill, buy a concert ticket, and schedule their appointments.[20]

  American Airlines; Northwest Airlines, and USAir are already testing In-Flight's new system which uses about 90 ground stations spread

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19. Anthony Ramirez, "Rethinking the Plain Old Telephone," The New York Times, January 3,1993, F (1).

20. Christopher O'Malley, "Smart Phones," Popular Science, January 1993, p.70-71.

across the continental United States to handle the calls from its equipment in the air. A number of companies, including Clairtel Communication and Hughes Network Systems, are planning to introduce an all-digital air phone system this year. This is because digital phones can make airplane phones cordless and portable.[21]

- Integrated Services Digital Network (ISDN) become universally available in all of France in 1991. ISDN can offer a huge public telecommunications network service. Its users can currently receive any publishing information, international stock market information, or local news report through the local telephone network with their computers.[22]

All these products and services are the fruits of telecommunication technology. When we enjoy them, we can realize that this is an information age.

3.4 A closer look

"What do you see?" is also important.

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21. Christopher O'Malley, "Airline Connections," Popular Science, March 1992, p.77,92.

22. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.162.

A light-weight, helmet-mounted video display monitor has been developed by the Battelle Company of Columbus, Ohio.[23] Users can focus on this personal monitor just inches away. This monitor is designed for seeing the dark recesses of the human body during surgery. It is also expected to apply in fields other than medicine.

Today, the hottest topic in the visual display field is "Virtual Reality".[24] The images that users see do not really exist. Virtual Reality works because the computer orients the images according to your personal movements that it picks up from sensory devices like head-mounted displays (HMDs), data gloves, or exoskeletons that the users are wearing. The images are totally produced by the computer. It is possible that people very soon will ***wear*** a television instead of sitting in front of it.

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23. Jan M. Rosen, "A Closer Look at Inner Organs," The New York Times, January 24, 1993, F(9).

24. Sharon Machlis, "Computer Create a New Reality," Design News, October 26,1992; p.60.

Chapter 4

In This Information Age,...

Many people call today an information age. Economists believe that we are living in an information economy. Some changes that have happened or are going to appear are also included in this chapter. Since I cannot include everything happening in our society in this thesis, I will describe only some changes in our classroom world and in our business world. In the last section of this chapter, "what an industrial designer can do" will be expanded.

4.1 Is it an "Information age"?

We are now in what is generally known as an "Information age". But the phrase is used so glibly and superficially that it has become almost meaningless. Not until the 1970s did most people realize the fact that the information age had already come.

Some people, such as governors, businesspeople, and economists, will pay more attention to the change happening to us and our environment because they need to lay out a later vision for our society.

"Information and information technology are at the center of this opening. Faxes provide students demonstrating in Tienanmen Square with information about what is happening in their own country and enable them to communicate

their story with the world." (Don Tapscott and Art Caston, 1993)[25]. The U.S. Air Force spends yearly billions of dollars on their satellites and the "Aurora" project[26] because governors realized that information is very important for them. This concept was proved correct in the Gulf War, 1991.

4.2 From a businessperson's viewpoint

Besides governors and economists, businesspeople are the third group facing a lot of challenges in this age. Information itself has become a hot and high-profit commercial product in the past twenty years. Some business advisors predict that it will continuously grow for the next twenty years. (see Fig.3)

It is not difficult to imagine how important the information business is in our general business market. People are doing business, and their success depends on timely and accurate information rather than mere good fortune. Correct information can help them to know their customers and competitors, find out about new markets, plan good timing, and to avoid mistakes and failures as

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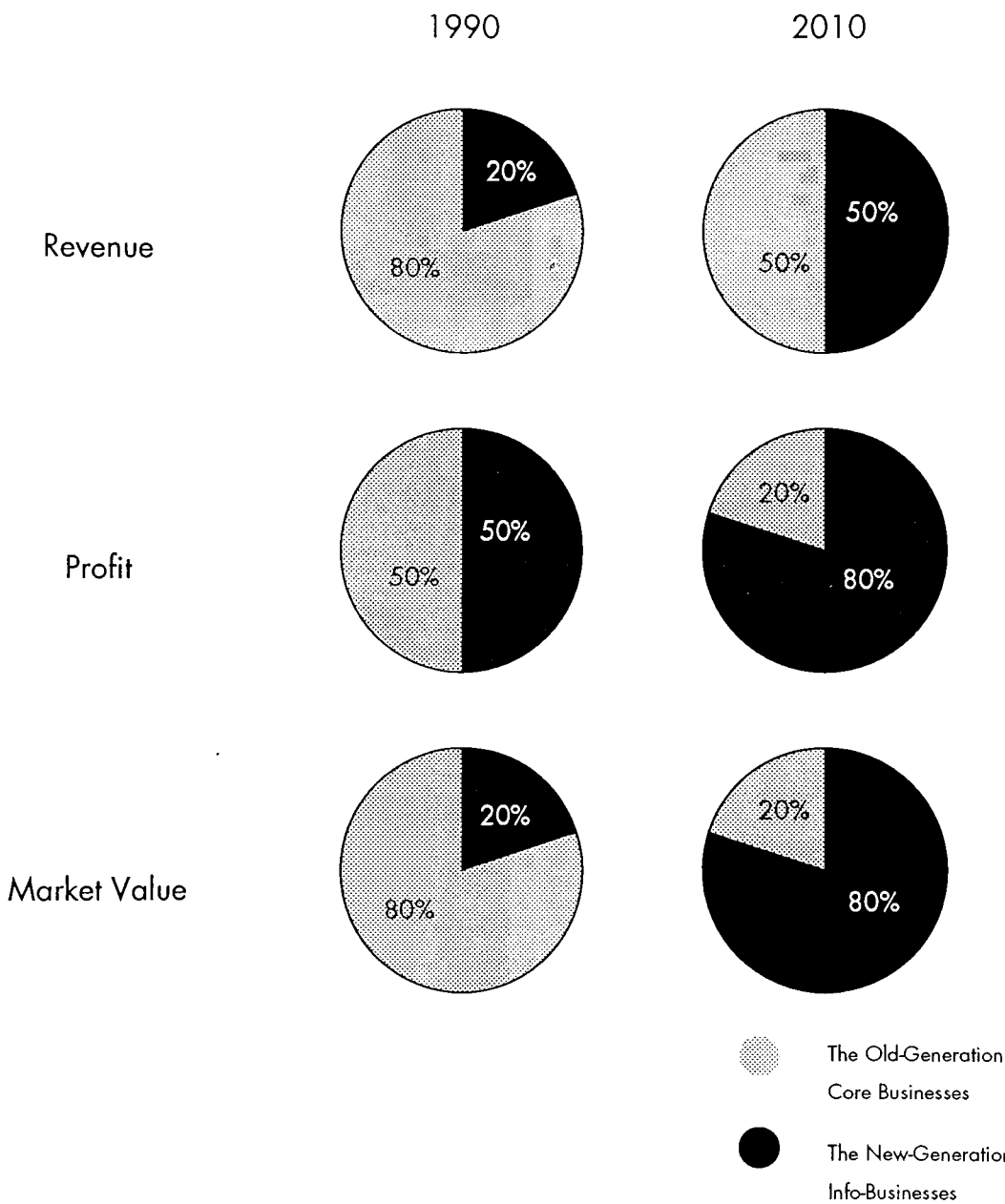
25. Don Tapscott and Art Caston, Paradigm Shift: The New Promise of Information Technology, (New York: McGraw-Hill,Inc., 1993), p.2.

26. Bill Sweetman, "Secret Mach. 6 Spy Plane," Popular Science, March,1993; p.56-59.

Fig. 3

Predicted Shift in Business Patterns [27]

1990 - 2010



27. Data from Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.109.

well.

For example, General Motors (GM) was the ultimate organization of the industrial economy. It had the biggest production lines and selling networks in the United States. After the 1970s, a lot of changes were made in their organization because they knew that the market, the economic style, and the value judgment of their customers, etc. were changing. The automobile market and economy become internationalized. Besides Ford and Chrysler, GM's competitors include foreign automobile manufactures such as Toyota, Honda, Nissan, Volvo, BMW , Audi, and so on. Nowadays, the bigger a company is the more competitors it has. The value judgment of customers becomes more mature because they were taught by those professional reports from automobile magazines. Facing these changes, GM has adjusted itself to fit into this highly competitive industry. Besides closing some factories and reconstructing their organization, they also do something special for their customers. They allow their customers to self-design highly customized car configurations on terminals in their dealers' showrooms. It is because they realized that people want their cars with something unique rather than those uniform packages.[28]

Nowadays, "information" becomes the linkage between manufactures and their product's market. This information is related to marketing research,

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28. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p.56.

new technology, and their own organizations.

What do businesspeople need? First of all, they want to receive and send information as fast as their equipment can. Secondly, they need to organize their time resources as well as they can. Third, the information they receive must be correct and complete.

4.3 A few changes in our classroom

Today, education is one of the most important topics because it is related to the future of all human beings. In the following, some changes in our classrooms will be described.

I believe that the children of the next generation will learn both new subject matter and new technology in a computer-controlled multimedia environment. For example, they will know about Newton's three laws from their computers instead of a blackboard and textbooks. Harry F. Olds, a senior scientist, predicted that American children in the twenty-first century will study with computer networks, laser videodiscs, CD-ROMs (Compact Disc-Read Only Memory), multimedia and microprocessor-based laboratories.[29] These interactive technologies are at the heart of an educational approach dedicated to the proposition that students learn by doing rather than by absorbing information from a mentor. When students have the equipment, they can learn

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29. Arthur Fisher, "EDUTECH," Popular Science, October,1992; p.68.

things everywhere at anytime.

Does it mean that we do not need teachers anymore? The answer is "NO." Teachers will have to teach their students more about moralities and social responsibilities in the modern age than about skills and knowledge[30] because much of the mechanical teaching of skills and knowledge will be done by computers. Teachers have to be educational experts. They will give most of their "capabilities" to stimulate their students' interest in learning. They will also help their students to build up their skills in problem-solving and cooperating with other people.

All these phenomena will be seen very soon in colleges and then high schools and junior high school as well.

4.4 What can an industrial designer do?

With the changes that I already have mentioned, industrial designers are facing some challenges in this information age. They need to put themselves into the current economy, to know people's needs, understand those available technologies which can be applied in new information products, and offer their manufacturers and the market some high quality design. They also need to

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30. Robert Welker, The Teacher As Expert, (Albany, New York: State University of New York Press, 1992), p.129-137.

design some products good for generating, processing, storing, and transmitting information. This is what I believe that an industrial designer can do.

Chapter 5

Design Development

"Reason is the first principle of all human work."

-Thomas Aquinas[31]

An industrial designer is often considered a stylist, a model-maker, and a sketch producer. In my point of view, an industrial designer should be an expert in problem-solving. A designer must understand real human needs and offer people some feasible and suitable solutions. In the last two chapters, some background about information has already been presented. This chapter is dedicated to explaining the design process of the Personal Information System. Concept exploration, form exploration, color, and graphics of this system will be described in the following sections.

5.1 Concept exploration

To design a personal information system is a challenging job for me because many experts and companies have already put a lot of time and

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31. St. Thomas Aquinas (1225-1274), Italian theologian.

wisdom into developing some similar products, such as Apple's "Newton" and AT&T's "Personal Communicators". Since I have a broad understanding of the main goals of this project, I selected three design concepts for application.

The first concept is applying the "Virtual Reality" technology into this project. All the information is displayed on a head-mounted display (HMD) which is connected to computer device. Users can input commands with a microphone. I think that an information system with a visual display which can be worn as a pair of eyeglasses is a good idea. There are some potential dangers to this system. When its users are wearing the HMD, they cannot see anything happening around themselves. The user might get hurt when he is doing his work with the system. It is a good, but not an ideal solution.

The second concept uses the basic idea from the first concept. The idea is that the user can see the information on a light-weight, helmet-mounted video display monitor. This monitor is supported by a flexible, adjustable arm attached to a head-phone set. The head-set system receives information through a cord from a computer device.

The head-set could be cordless; however, in the interest of quality information transmitting, I decided to keep the data cable for this system.

In this concept, the information system has audio and visual outputs. Commands are input through a microphone on the head-set.

The third concept is similar to a palm-top computer with audio output. The system will show the information on a LCD (Liquid-Crystal-Display) touch

screen and omit the keyboard to keep it small.

Besides these three concepts, I have already laid out a few design criteria which are my guidance in the design process. These criteria are as follows:

This system is a personal product.

- It should have both audio and visual outputs. These functions make this product become more universal so the deaf and the blind can use it easily.
- Its users can carry it in different ways.

It should make technology user-friendly.

Finally, I decided that this product should have two parts, a head-set and a hand-held machine. The head-set includes an audio input/output (a head-phone with a microphone) and a visual output (a display monitor). The hand-held device includes a pen-based LCD screen, power switch, PCMCIA (Personal Computer Memory Card International Association) card reader, and a few connectiors.

5.2 Form exploration

"Form has no shape or dimension. Form merely has a nature, a characteristic. It has inseparable parts. If you take one part away, form is gone. That's form. Design is a translation of this into being. Form has existence, but it doesn't have presence, and design is towards presence."

Louis I. Kahn[32]

Before I started to design the form of this product, I studied some personal products in the market. I also asked those product's users about their own using experiences. Designers used to decide how users use and carry their products. For some products, it could be right. I would suggest that a personal product designer should give more freedom to users who may have different needs and personal tastes.

This system includes a head-set and a hand-held device. First, I designed a form for the head-set. After I studied the related technology, I know that it is possible to produce a light and thin LCD monitor. I want the user to wear this head-set safely. So I designed a second band to stabilize the head-set

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32. Ann Mohler, Louis I. Kahn: Talks with Students, (New York: Wittenborn and Company, 1969), p.32-33.

on the user's head.

I was concerned about its mechanical structure and its market price. It will cost between 1500 to 2400 U.S. dollars. The age of its customers is above twenty-five. I gave this head-set a gentle look because I believe that the customer of the last five years would like to see this product in a clean and gentle facade.

Next is the development of what the hand-held unit looks like. The first consideration is how people carry this unit. People may carry it in their pockets, on their waist belts, under their arms, or hanging around their necks. A concave bottom which can fit the curved shape of human waist, arms, and chest's sides made a good starting point. It is impossible to make the shape perfectly fit those positions. The reason for using a concave shape is that it will make the user feel more comfortable than the flat surface does. Using flexible circuit board technology[33], a curved circuit board can make this idea come true.

In addition to the back shape, this device is given a 'S' shape on one side. The convex/concave shape assists its user to hold it easily. The whole product is designed in a 'sandwich' form. When the users are writing on the LCD touch screen with the cordless stylus pen, they can rest their hands on the housing surface. This design is to protect the screen from unnecessary

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33. Gary Chamberlain, "Materials Put the Flex in Flexible Circuits," Design News, October 10,1992; p.92-98.

damage.

To design the details, I plan each detail, such as switch, output, and power input, with a clean look. The clean look with graphic label helps the user to easily identify each switch and button without misuse. It makes the product more user-friendly.

When I was doing the form study, a few art historical concepts came into my mind. Fundamentally, I did not desire any particular historical style. If I am asked to identify its style, it should be in the "Post-post modernism" current.

In 1960s, Post-modernism was supposed to save us from the uniformity of Modernism, but now it finally appears more uniform than what it replaced. In the 1990s, we see a broad spectrum of design solutions embodying both Modernism and Post-modernism ideals. Art historians named this current "Post-post modernism" which is seeking a natural rather than self-conscious manner.[34]

In the Eastern culture, "Nature" is a traditional ideal that many artists and philosophers are seeking. "Nature"has its own rhythm, spirit, and laws. Any change of an object's outlook is originated by its inner change. The inner change can happen to its structure, function or different life period.

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34. Houghton Wetherald, interview by author in "American Architecture" class, 12:05 p.m., February 12, 1993, Rochester Institute of technology, Rochester, New York.

To express the spirit of a main object, a Chinese artist might fade away the surroundings and use a simplified paint style to catch its inner spirit. Chinese people call this inner spirit – "i".

For example, in Fig.4[35] and Fig.5[36], we can see that Hung-jen[37] focused only on the simplified out-shape of the "Tamed Dragon Pine" and neglected the background intentionally. What he wanted to express was not an accurate scene of shape, but the spirit. Through the simplified out-shape, Hung-jen caught the life force of the Tamed Dragon Pine.

These concepts keep flashing in my mind when I was doing the form study. I have applied them into my design.

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35. James Cahill, The Compelling Images, (Cambridge, Massachusetts: The Harvard University Press, 1982), p.154.

36. Ibid., p.155.

37. Hung-jen (1610-1663), a famous landscape painter in Ming Dynasty, China; for his biography , see James Cahill, "Hung-jen," Dictionary of Ming Biography, vol. 1 (New York, 1976), p.675-678.

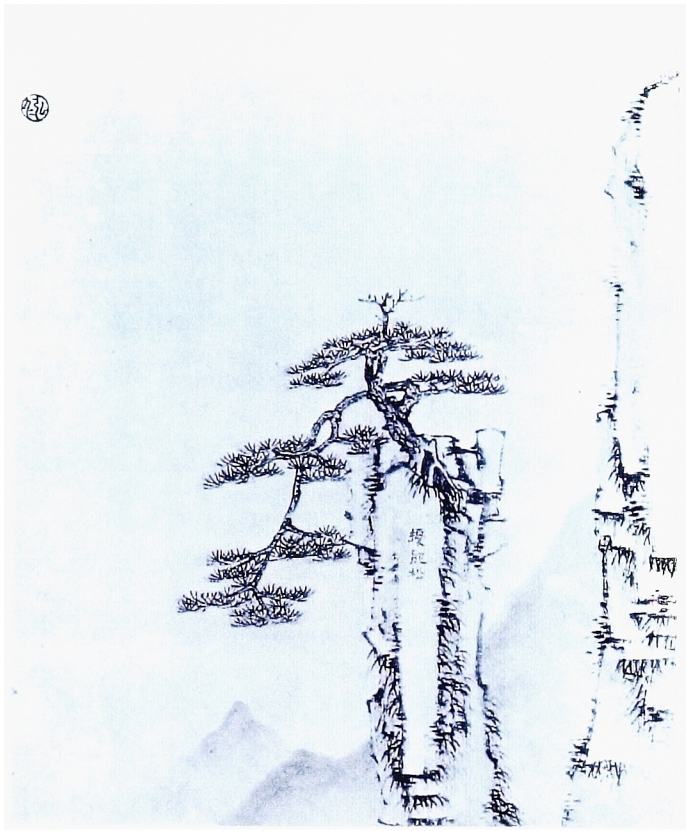

Fig. 4 Hung-jen(1610-1663), Tamed Dragon Pine. Leaf from an album of scenes of Huang-shan, ink on paper? Peking Palace Museum.

Fig. 5 Photograph of the cliffs and pines of Huang-shan.

5.3 Color

To give this system an active look, I chose some light colors rather than those electronic products' colors, such as black, gray, and silver. I decided to offer two color schemes for this system.

For the first color scheme, I choose snow white (PANTONE 11-0602) with apricot (PANTONE 15-1153) and shale (PANTONE !9-3903) dots for the middle part of the hand-held unit and the head-set. The top and bottom parts of the hand-held units are in purple impression (PANTONE 17-3919).

For the second color scheme, I choose the same white with apricot and shale dots for the middle part of the hand-held unit and the head-set. Fawn (PANTONE 16-1510) is applied for the top and bottom parts.

The purple and fawn are with a rustic shiny look. Along with these main parts, both schemes have switches in apricot and the infrared signals receiver in polished pistachio (PANTONE 16-0120).

5.4 Graphics

In this project, I gave more attention to the graphic design for the man-machine interface than to the logo design. Considering the universality, I marked each outlet in both letter and graphic pattern to help users easily identify the outlets' functions.

For the screen display, seven icons with letter forms make the system user-friendly and efficient to use. (see Fig.6)

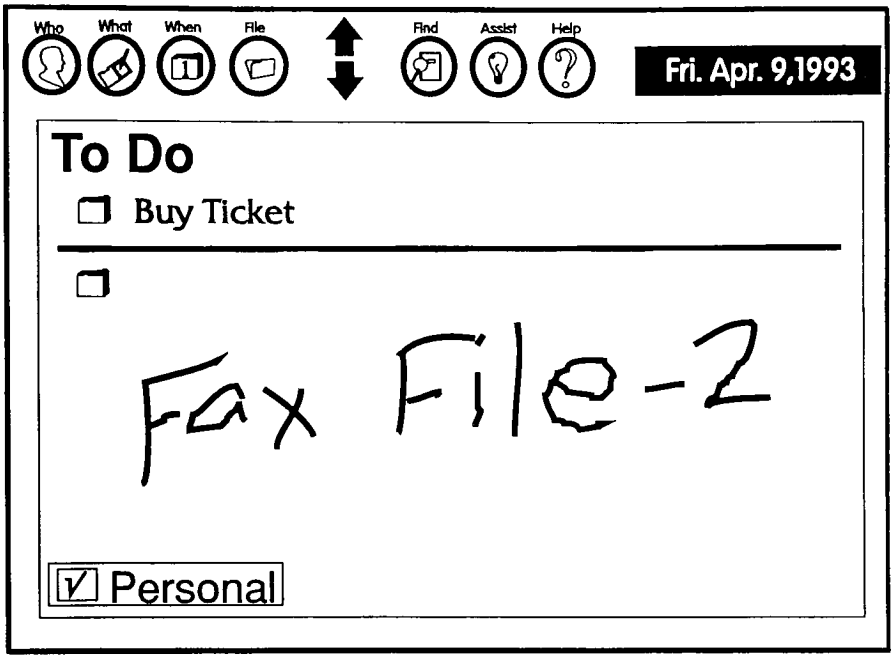

Fig. 6 Screen display

Chapter 6

Product Components

The Personal Information System consists of five parts: a hand-held unit, a head-set, a cordless stylus, IC (Integrated-circuit) cards, and two outlet cords. In the following sections, these parts will be explained.

6.1 Pen-based LCD (Liquid-Crystal-Display) touch screen

The 85x120 mm pen-based LCD touch screen is the major in/output medium in the personal information system. This pen-based LCD touch screen technology is already available in many palm-top or pen-based computers. The first pen-based computer was seen about 1987.[38] Today, manufacturers are still working to reduce its thickness and production costs and to have a good quality display.

The panel is a 1.2 mm thick LCD display covered by a transparent tablet that the user will write on with a cordless stylus. The writing will appear on the screen for a moment (see Fig.6), then software will transform it into computer

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38. John Wagoner, "Other Pen-Based Computers," MACWORLD, August,1992; p.130.

characters or graphics. All the recognition and transformation process will come from a RISC (Reduced-Instruction-Set computer) microprocessor.[39]

6.2 Head-set

The head-set carries the other in/output media in the system. It includes a headphone, a 100x80x12 mm^3 visual display unit, and a microphone which is placed below the monitor. The monitor is connected to the headphone by a flexible and adjustable arm.

The head-set is optional equipment for the user. Wearing this head-set, the system's user can use his hands for doing other things. The microphone becomes the only input media at that time. With current technology, the system cannot totally operate the telephone function, but I am looking forward to improvement in the near future.

A 86x54 mm monitor on the display unit of the head-set gives its user a complete view of the information he needs. If the user wants the audio output, he can hear the speech output from the earphone of this head-set.

This audio input/output function can also assist those people who are blind to send and receive information easily. To use the audio output, the user

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39. Richard L. Sites, "RISC Enters a New Generation," BYTE, August, 1992, p.141.

needs to plug a suitable IC card into the hand-held unit. The system will do the transformation by itself.

This head-set is connected to the outlets on the hand-held unit with a cord. This cord provides good quality transmission.

6.3 Receiver

The receiver near the power on/off button can communicate easily with other data devices by infrared signals around it. The infrared link operates to a distance of about six feet,[40] so the user can send files across the table. When the related technology becomes more developed, the diffuse infrared capability will allow the user to log onto the main network in a conference room or inside an airliner.

6.4 Power supply.

The electric power is supplied by a lithium polymer rechargeable battery which is installed from the back of the hand-held unit. (see Fig.7) The power supply can also depend on DC 9V current supplied by an AC adaptor.

The characteristics of the lithium polymer battery is that it is thin and flexible. It can fit the curved shape design of the hand-held unit. The battery

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40. Liza Weiman and Tom Moran, "Newton," MACWORLD, August, 1992; p.131.

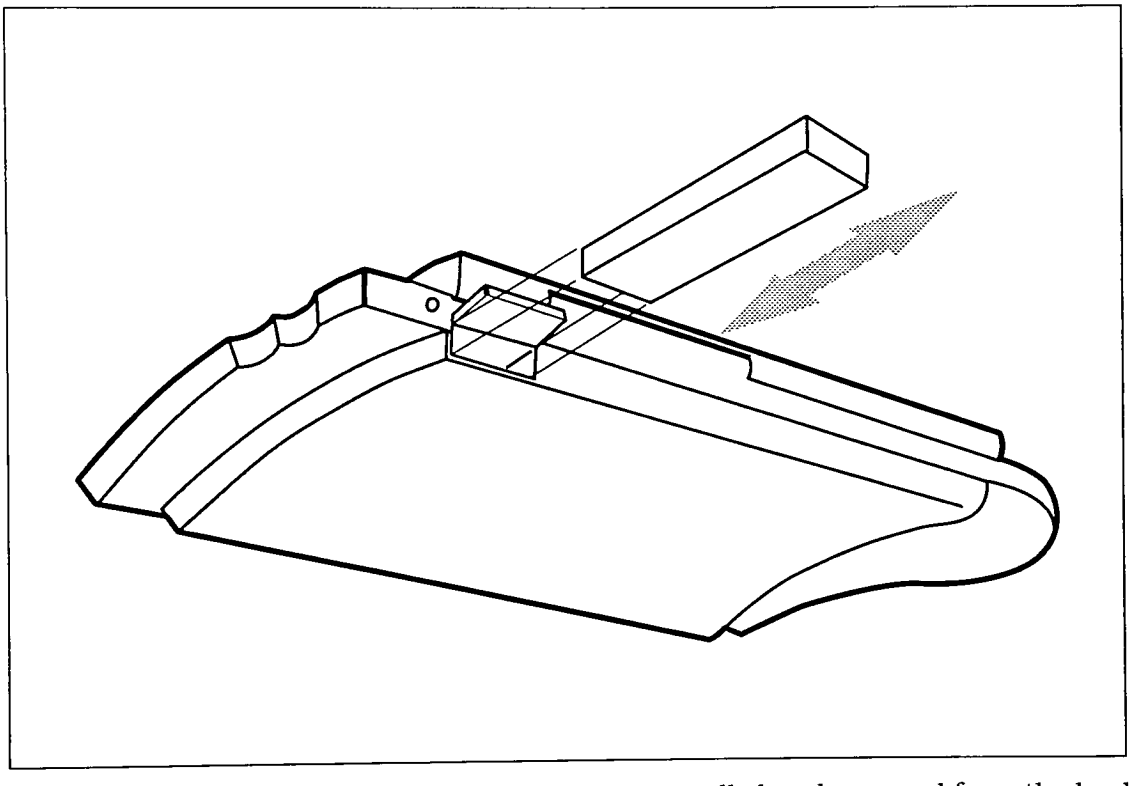

Fig. 7 The battery is installed and removed from the back.

will also operate as four times as long as nickel-cadmium batteries of the same size.[41]

6.5 Integrated-circuit (IC) card

The integrated-circuit cards are for personal information system storage of information, and operate different functions. When those cards are plugged in, the system can do the speech-text translation, receive electronic mail from the network, receive the infrared signals, send fax, and transmit information as well.

PCMCIA (Personal Computer Memory Card International Association) card[42] was already mentioned before in this thesis. It is a relatively new standard for IC cards, one that is gaining rapid acceptance.

6.6 Input / Output connections

Besides the electric power input, there are three connections on the left side of the hand-held unit. Audio and visual outlets are used for connecting to the head-set. The other I/O port is for connecting to the user's personal

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41. Reinhardt Krause, "High Energy Batteries," Popular Science, February,1993; p.64,68.

42. Russell Ito, "Newton's World," MacUser, August ,1992; p.46.

computer or telecommunication network. Through this port and certain IC cards, a user can easily transmit information between this system and a modem or other communication module.

Chapter 7

Conclusion

Civilizations, economies, companies, and products, like persons and all other living things, have their life cycle. A bio-economy will come after the information economy by 2020s. The information economy will still have strength for ten years or more while the next economic age develops in its period of gestation and development.[43]

In the coming years, many companies, such as AT&T, IBM, Apple, Sharp, Casio, and NEC, will keep introducing their "smart" information products into the market. As I write this thesis, some related technologies are either undecided or undisclosed. I expect that the communication capabilities of those coming products can be expanded. Additionally, I would hope that technology makes these products relatively inexpensive. It will benefit many people, including the deaf, the blind, and students.

Whatever the future may hold, it is clear that computers are ready to jump into our pockets. Not only can we look at its screen and type on its keyboard,

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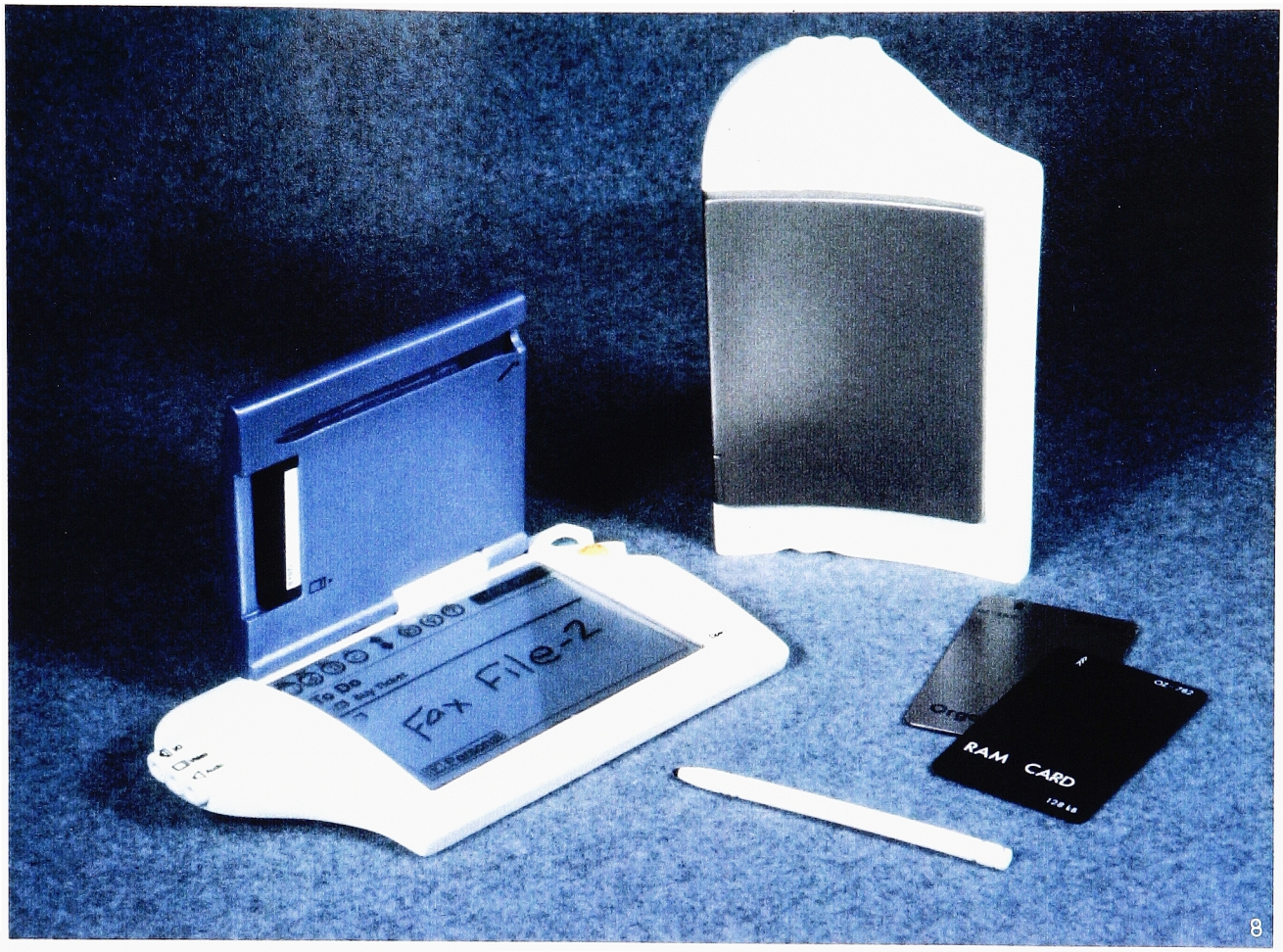
43. Stan Davis and Bill Davidson, 2020 Vision, (New York: Simon & Schuster, 1991), p. 180.

but we can also hear its speech, write on its screen, and even speak to it.

In the future, businesspeople will be able to send a fax to their business partners in a taxi. Students can check out and read any favorite books and materials from any library. They will go to school to discuss what they have read last night with their teachers and classmates.

Being an industrial designer, I would hope that all people can enjoy these information and telecommunication products in their daily lives.

Appendix



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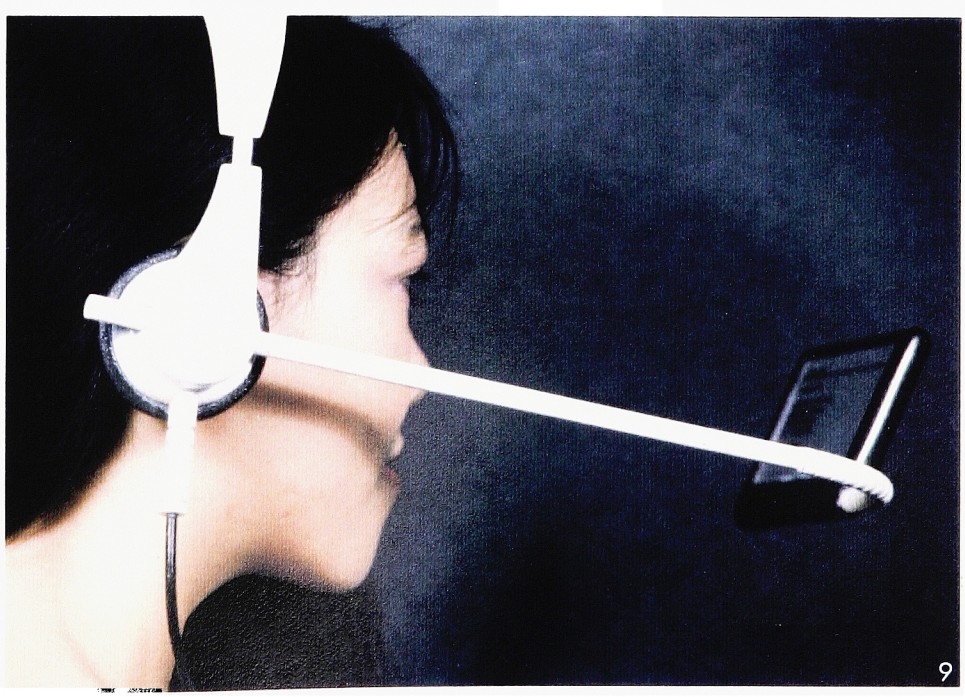

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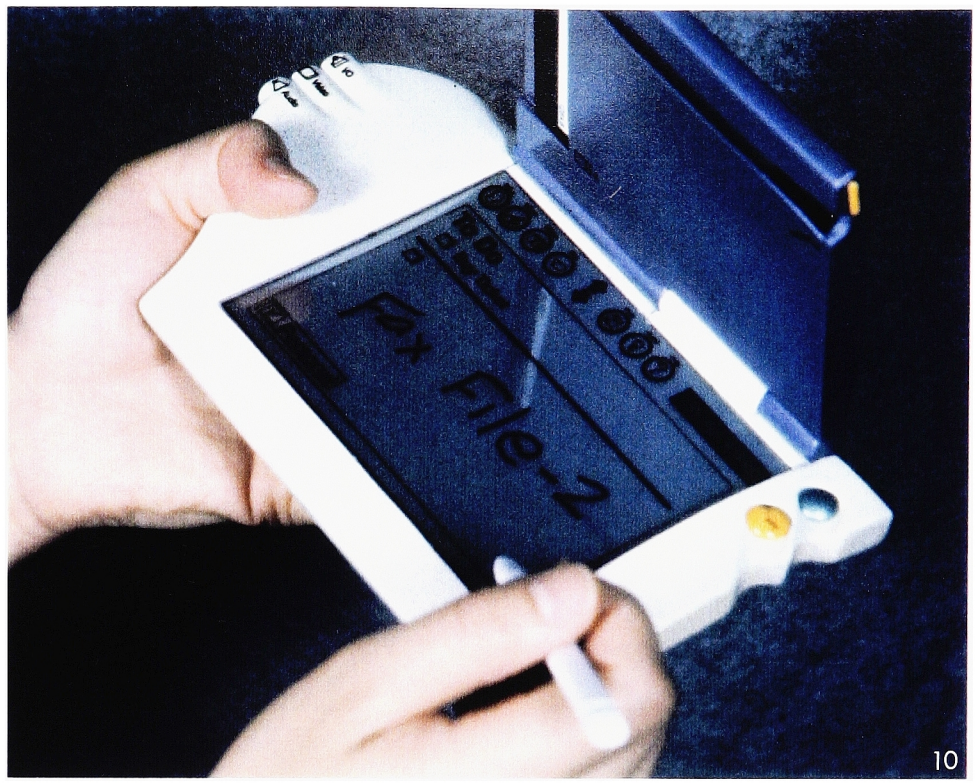

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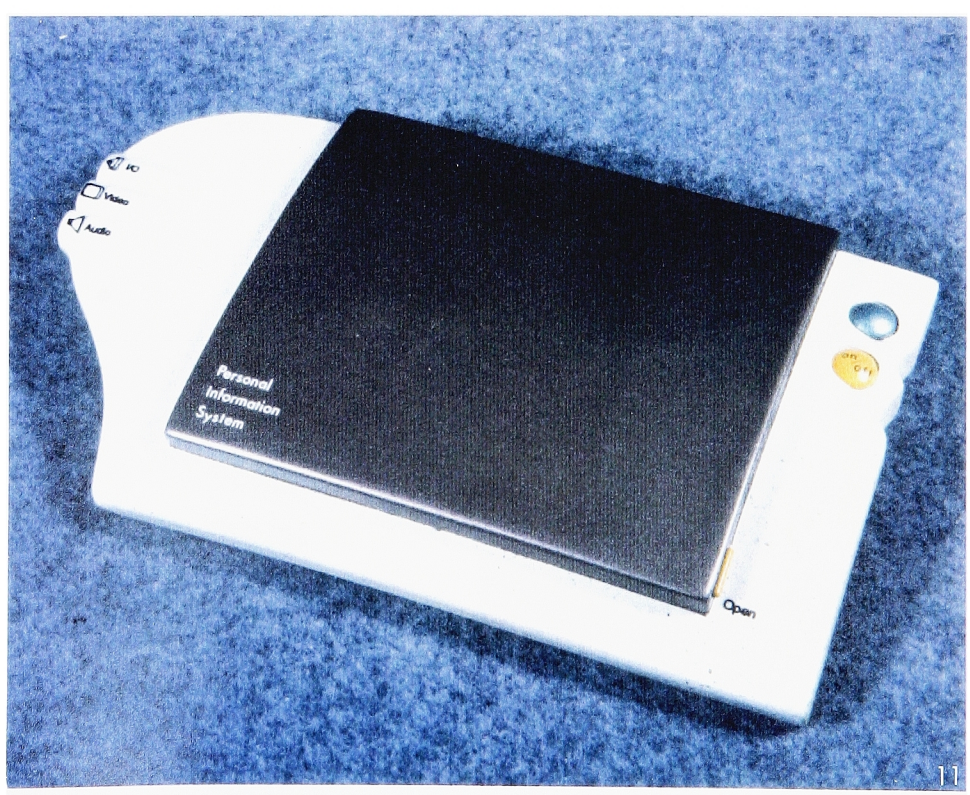

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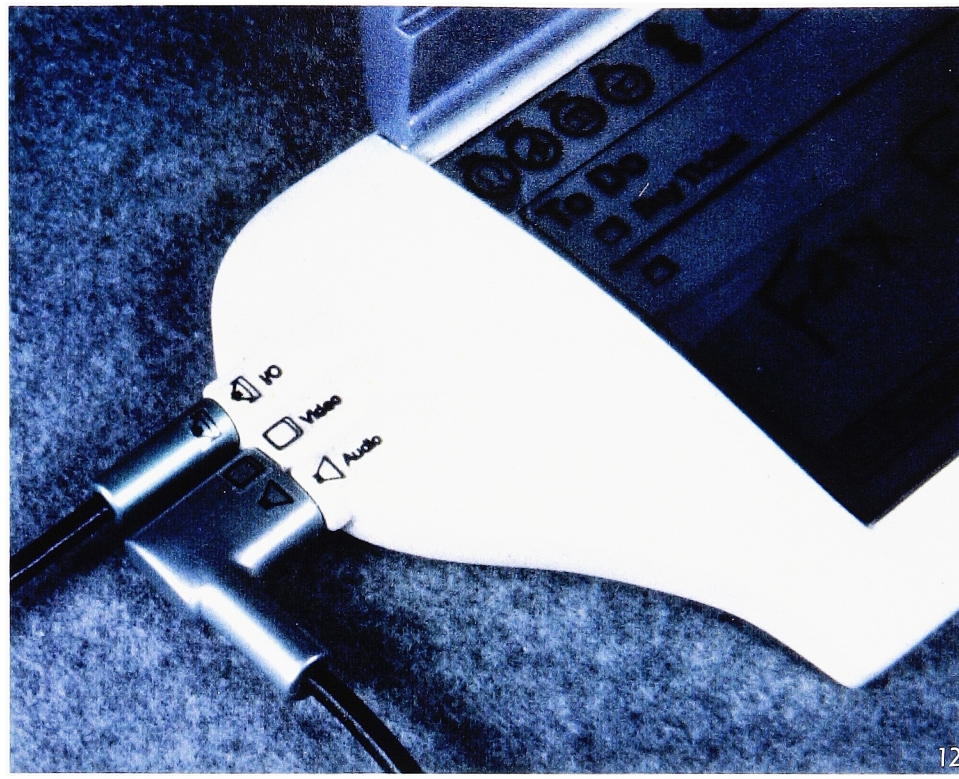

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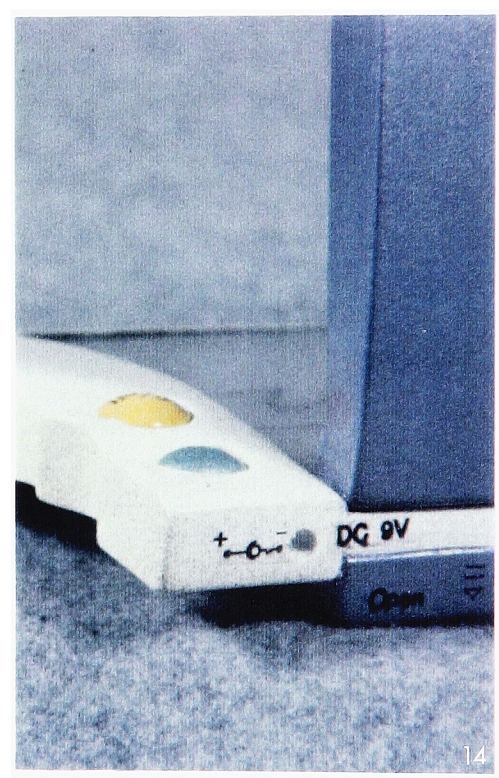

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