# *Introduction*

According to what I learned from anthropology over a half-century ago, the first humans to appear were the Peking man and the Java man about 100,000–150,000 years ago. Even if these figures were allowed a wide margin of error, the commonly held view then was that they would not exceed one million years.

However, currently, the origin of humankind (*pithecanthropus*) is said to date back to five million years ago, which differs from the previous estimate by an entire digit. Furthermore, today, humankind is said to be subdivided into the categories of *pithecanthropus*, proto-man, paleo-man, and neo-man. Still, compared to the origin of life, which is estimated to have emerged approximately 3.6 billion years ago, the birth of humankind differs by three digits and can be seen to be extremely recent.

In this way, it can be seen that as times change, it becomes necessary to make drastic changes to the text of knowledge as well, as the anthropological example above demonstrates. In other words, discoveries and inspections of remains have the ability to change what we should be studying to a substantial degree, and in some cases, they may change them on a fundamental level. Inventions and discoveries, which are subjects that lie at the heart of this book, are testaments to humanity's right and obligation to progress. Seen from a certain perspective, they can be considered as the greatest privilege offered to the primate known as human.

This teaches us not to be too captive to preconceived ideas. For example, regarding human civilizations five to six thousand years ago, if you look at the arts and cultures of places like Crete and Santorini, where Egyptian civilization and the Aegean Sea played central roles, and additionally, if you look at the lost articles of Troy, it becomes clear that their levels of art and technology were highly advanced already. Generally speaking, it is not impossible to suppose that considerable cultural exchanges had been taking place between civilizations back then. Consequently, if excavations of ruins around such regions continue, the world history of civilization itself, including the hypothesis of Atlantis, may see drastic alterations.

Relative to such a long-term, macroscopic observation, this book concentrates on an extremely short-term and microscopic perspective. Even when the phrase "long-term" is used, I will be referring to units of several decades at most. Additionally, while handling ultra short time frames, such as the microsecond, nanosecond, and the picosecond (which is one-trillionth of a second), I will also make unfazed use of supplementary units of extremely gigantic memory capacities, such as mega, giga, tera, and peta ($10^{15}$ times). With such frames of reference in mind, let us proceed by beginning with a contextual understanding of the times, which is necessary to have in order to carry out R&D, new product development, and new business development.

## 1.1 From the Age of Information to the Age of Information Communication (Network)[1]

In the first edition of this book, I pointed out that if I began to mention waves of change that surged as we headed towards the

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[1] While David Moschler foresees a contents-centric era during the period from 2020 through 2030 subsequent to the arrival of an (information) network-centric era, there are books such as Masakazu Kobayashi's *The Disappearance of Content* (Kobunsha), which warn otherwise. So it can be seen that the future is in no way set in stone.

21st century, such as the liberalization of communication, financial deregulation, sudden fluctuations in the exchanges and stock prices, relaxation of regulations, and agricultural liberalization, there would be too many examples to mention in their entirety. Moreover, I mentioned that they were merely the first waves and were going to change shape and surge again as second and third waves.

As a solution for reinforcing your organization and improving your personal life, I also emphasized that you had no choice but to detect these waves beforehand and not only ride them out successfully, but at the same time, acquire, process, assess, and interpret relevant information from an enormous amount of data or obtain a small amount of information (which are nevertheless crucially important), from the most appropriate information media or information provider.[1]

To this end, I pointed out that it all depended on having a sufficient grasp of the characteristics of the information age, which occupies a fundamental place in the context of the times, and on how you go about preparing and reinforcing your organizational or personal information management system.

Even as we find ourselves headlong into the first ten years of the 21st century today, such observations continue to remain relevant. Even so, I did not foresee that the wave of the commercial internet, which was not that strongly anticipated in the 1980s, would have had as large an impact as it has today on our business activities and day-to-day living through the development of communication equipment and communications technology as represented by PC networks and cellular phones.

According to the Computer Industry Almanac, September 2004 figures showed that the number of global Internet users exceeded 930 million, and at present (as of October 2006), it is by no means off the mark to claim that on average, one out of every five to six people in the world is estimated to be an Internet user.

In fact, it is believed that this is an extremely conservative estimate. Among these users, the number of Internet users in Japan is 77.3 million (December 2004 survey on telecommunication usage trends conducted by the Ministry of Public Management, Home Affairs, Posts and Telecommunications), and surprisingly, this translates to the fact that more than one out of two of the total population is making use of the Internet.[3]

On the other hand, the number of cellular phone Internet users is nearly the same, surpassing 71.93 million (June 2004 data from the Ministry of Public Management, Home Affairs, Posts and Telecommunications). This research is performed every month, and shows the total number of users of the cellular phone enterprises, i-mode, EZWeb, and Vodafone (now Softbank). However, users who are not accessing the web are also counted. If we take these figures and the prediction that the number of personal computers will easily exceed one billion in 2007, it becomes clear that the first half of the 21st century cannot merely be described as the age of information — that would be an insufficient description. Instead, it would be more appropriate to describe it as a period seeing a transition into the age of information communication, which encompasses information networks and functions.

In the *White Paper on Computerization* (2005 edition),[2] the government reexamines the former "e-Japan" strategy, which had as its aim "the realization of Japan as the most advanced information technology nation in the world by 2005," and presents a future image of a ubiquitous network society dubbed "u-Japan," where a free flow of information will be realized through a network that can be accessed "at anytime, from anywhere, by anything, and by anybody." The paper also explains what policies are needed to realize such an aim.

The idea behind this u-Japan is conveyed by the following four words that begin with the letter U: ubiquitous, indicating a time when communication plays a vital role in every aspect, linking every person and every object together; universal, indicating ease of use

regardless of age or handicap; user-centric, indicating the merger of the user viewpoint; and unique, indicating the blossoming of individuality to help express higher creativity. At the heart of u-Japan, however, is "ubiquitous," emphasizing that it is about a society where communication takes place easily between not only people, but also between people and objects and between objects themselves.

So what kind of presence should organizations and companies have in such a ubiquitous age? How should they act? Furthermore, how should they go about fulfilling their roles? I would like to attend to these questions in the next section.

## 1.2 A Course of Action for Companies in the Ubiquitous Age

To clarify the ideal role and conduct for companies existing in an ubiquitous society, which is a society that exists in a highly complex information communication age, we must first of all grasp the characteristics of an ubiquitous society.

Firstly, in the advanced age of information, the quantity of information transmitted in a given period of time is extremely large. Just as more and more expressions used to indicate sums of money are seen to be going from the trillion-yen unit, as seen in the gross national wealth figure of 1,400-cho yen (1,400 trillion yen or 1.4 quadrillion yen), to the ten-quadrillion yen unit, the expressions used to indicate memory capacity and information storage capacity, such as the megabyte and gigabyte, are seen to be increasingly giving way to the general adoption of expressions such as the terabyte, the petabyte, and even exabyte, in fields that handle high capacities of data like business intelligence analysis.

Secondly, there is an increase in the number and types of information means and media available for transmitting these large quantities of data. The main public and private information media include the newspaper, magazine, book, telephone, and radio, in addition to

CATV, fax, electronic bulletin board, blog, electronic conferencing system facilitated through computer and television networks, online shopping spaces made available through personal computer networks and cellular phones, and countless databases and knowledge-bases, including home banking, travel information and game networks. Activities closely associated with day-to-day living and work, such as placing orders, invoicing, carrying out payments, and requesting materials, are designed to be reliant on brand new electronic intelligence media that are being rapidly developed one after another.

In particular, in the age of information communication, it is expected that services such as non-contact IC cards, GPS functions, services using electronic tags, music delivery, and home security services will become even more widespread in the form of new "information-service media" or as services that help to make use of such media. These services will help to promote efficiency in work, while also reducing workload and saving time. Furthermore, in terms of day-to-day living, these services will also heighten the sense of security and help to de-stress and raise satisfaction levels.

However, as a third point, we must also turn our attention to the flip side of all this and touch upon the points of information security and its limits. This is because there have been no end to the damages incurred and abuses committed due to leakages of governmental and corporate information, and additionally, the private information of individuals. Consequently, instances have occurred where societal functions and security functions became paralyzed, which is a situation that was unimaginable during times when information networks were not that advanced yet.

Currently, we have entered into a situation that demands our constant vigilance, as cases of computer viruses have become outnumbered by cases of the even more malicious spyware programs. For this reason, companies are making considerable investments in computer security and adopting defensive policies, but it remains

difficult to say that the situation has seen any improvement. This is because there is a vicious circle in place that sees the tit-for-tat development of new, highly advanced viruses and spyware for every new, highly advanced security measure adopted.

Moreover, with the problem of information leakage and information tampering being basically a matter concerned with issues of ethics, morality, and a sense of mission, information managers cannot possibly be expected to be in complete control, since that would mean that they would have to be in control of the feelings of people in the company as well. This is a major setback.

Despite this dark, forbidding situation, on the whole, the emergence of the age of information communication and the ubiquitous society in particular have blessed companies with many opportunities as well, and depending on your point of view, it can be considered as indicative of the arrival of a time when we will see the fulfillment of important roles that could not have been anticipated in the past. I would like to address these points as follows.

Firstly, while duties such as new product and new business development and R&D had been previously assigned to only a limited number of those in charge, when the nature of ubiquity begins to spread within a company and the duties within the company become seamless with the advancement of networks, it will become very likely that interest in such tasks will be shared by all employees.

Currently, as internal networks increase, more and more formal, or perhaps informal, intra-company communities are seen to be emerging and evolving. With such communities, the setup often allows for a quick understanding of "who the most experienced and informed people regarding a certain development project are." If this setup is designed correctly, improvements and upgrades will continue to be made, room is made for presenting value-added ideas, and fantastic projects could be completed over an even shorter space

of time, which should in turn help to bring about the success of new product and new business developments.

Secondly, the strength of such intra-company communities lies in their ability to help increase opportunities whereby participants can freely discuss what is on their mind, or in other words, their tacit knowledge. Tacit knowledge refers to the type of knowledge that people consider to be still half-baked or the type of knowledge people are reluctant to make known at times, as opposed to explicit knowledge, which refers to knowledge that is already out in the open. However, in communities that function on a virtual level, going beyond time and space, the clash of ideas (fusion) occurs more readily, which drastically increases the chances of paving the way to unexpected new products and new businesses.

Thirdly, the characteristic of going beyond time and space means that all R&D approaches on the face of this earth will become ongoing and multilevel. In other words, a project that progresses to some extent within an eight-hour workday will be inherited by the staff located in the next time zone where the workday is about to begin, and when the workday ends in this time zone, the project will be inherited by the staff in the next time zone where the workday is about to begin, and thus the project will never be stopped. What's more, if a three-shift schedule is adopted within the same region, then it will be possible to maintain continuity within that region alone. Furthermore, if the same or related projects are advanced in parallel with several teams, then the multilevel nature can be increasingly amplified. In addition, with the sharing of knowledge, we can hope for a rise in value-added ideas created through exchanges among experts of diverse areas.

In this way, at least theoretically, it will not be surprising at all to see a dramatic rise in the speed it would take for R&D projects to link to new product and business developments, and, on the whole, make it possible for the ubiquitous society to continue to churn out

unprecedented new products and new businesses. In fact, whenever we are not able to create new products and businesses through collaborations or whenever we find the creative output to be infrequent, we should be questioning whether there are any flaws in the system.

Since business intelligence (BI) information systems are being increasingly adopted as one of the key means to enlarge these structures, I would like to end this introduction by touching upon such systems.

## 1.3 Development and Deployment of Three Business-Intelligence (BI) Type Information (Management) Systems

A bird's eye view of how information systems have developed up to the present reveals that the 1950s and the 1960s were the time that saw the development of the task-oriented, localized information systems. For example, information systems geared towards production management/process control were at the heart of those systems. Subsequently, the 1970s arrived and saw the development of finance-centric information systems at first, accompanied by improvements in computer functions. Then, towards the latter half of the 1970s, the development of task-integration or companywide types followed. This writer has also participated in this type of project in the US from the end of the 1960s through the 1970s.[4]

Upon entering the 1980s, the fifth-generation computer project[5,6] was started in earnest as one of the national projects and came into global prominence. On a parallel track with this, information systems based on Artificial Intelligence (AI) models, Expert System (ES)[7] models, and additionally, the Fuzzy Expert System (FES)[8−11] models came into the limelight as well.

Furthermore, interest was raised in information systems for acquiring, applying, and assessing strategic information and for developing strategic information systems that carried out strategic

applications of information. Consequently, these systems became buzzwords during the 1980s and the 1990s. The phrase "strategic information" (or knowledge information) became synonymous with the word "intelligence." In other words, strategic information became key information concerned with the existential success or failure of an organization or company, and therefore became a buzzword no one could afford to disregard, irrespective of how information systems had developed.[12]

There was a sense, though, that such a forward-looking phrase was forgotten during the economic slump of the 1990s. The impact of the commercial Internet during this time was substantial and as personal computers saw improvements in performance and their networks began to spread, information systems that could be described as decentralized information communication network models, which were, in a static sense, dependent on workstations, were developed, and consequently, the phrase "strategic information" came to be forgotten.

With the arrival of the 21st century, the movement to grasp in a more positive light the significance of information systems built on information-communication networks became more active, and the term "intelligence" was restored to replace "strategic information" and "knowledge information." In particular, people became convinced of the appropriateness of business intelligence in the domain of the private enterprise, and consequently, business intelligence type (BI-type) information systems appeared. Along with increases in books and products,[13–15] the concept is beginning to come into prominence.

The first characteristic of the BI-model information system is that, by definition of being an information system, it fundamentally inherits the concept of strategic and confidential information. In that respect, it can be considered to be an improved version of the Strategic Information System model.

But just what about this is different from the strategic information system that had come into prominence in the 1980s? In terms of computer systems, the first difference is undoubtedly the development of systems and techniques that made it possible to immediately perform information processing analysis of high-volume data such as those in the terabyte range. We cannot overlook the point that it had become possible to make effective uses of ultra-large volumes of data that had accumulated to date.

However, accumulating ultra-large volumes of data is an entirely different story from detecting and acquiring truly valuable information, and we must be wary of this difference. No matter how abundant the amount of information gathered may be, it must not be forgotten that there is no other type of information easier to gather than the useless kind.

Generally speaking, this is because the more valuable the information becomes, organizations will raise their level of confidential classification and toughen their guard by taking encryption measures to assure such data does not get out, and even if there is a leak, they will see to it that decoding is rendered difficult.

Secondly, tools that realize BI are often categorized as knowledge types, simulation types, or automatic types (AI-augmented types).[16] The knowledge type attempts to incorporate ideas and techniques of areas that pursue information value and information sharing by including fields of knowledge that had attracted attention since 2000, such as knowledge engineering and knowledge management.

On the other hand, the simulation type makes use of data warehouses and data marts, integrates metadata through the application of ETL tools, and aims to generate and use BI through recursive, multilevel analysis by adopting such measures as OLAP.

The automatic type attempts to systematize and automate types that used to carry out decision-making by automating the decision rules that were formerly set by AI and ES types. Towards this end,

the automatic type attempts to make such types apply to business rules and a typical example of the automatic type is the Business Rule Automation.

The third characteristic of the BI-type information system is that it is closely tied to groupware such as Lotus's Notes/Domino, Hitachi's Groupmax, and additionally, GroupSystem,[17] which was developed at the University of Arizona. Such groupware realize their worth when they function as a means for facilitating group collaborations. By making use of such groupware, it becomes possible to carry out idea-generation sessions and productivity evaluations of meetings, which are ends that could not be achieved through features of the communication network alone.

The BI-type information system, which is seeing a penetration into the World Bank and NASA, is apparently also penetrating into most companies in Japan as well in one way or another, but mainly to companies in the service sector, such as trading companies, supermarkets, and convenience stores. For the future, I should like to hope for the development and maintenance of systems endowed with more strategic capabilities, demonstrable competitiveness, and a high level of creativity.

This therefore concludes my brief coverage of BI-type strategic information systems for civilian enterprises with a focus on their aspects of computer technology. As for strategic information systems concerned with aspects of national strategy and military strategy, and additionally, competitive strategy, space limitations have prevented me from touching upon them at all. Readers interested in these subjects are advised to refer to the references found at the end of the chapter.[18−20]

This book clarifies the answers to the following questions to help you realize successful R&D undertakings, and in particular, new product and business developments. Firstly, how should you view the R&D environment from the present onwards?

Secondly, what forms should strategic plans and the management of R&D developments take in light of the fact that they are integral to the survival and growth of organizations and companies? Thirdly, what are the types of plans and methods of selection and assessment available for R&D projects that arise from such management? And fourthly, how can you attain the systematization and assetization of information, which will form the basis for such methods and lead R&D programs to success? In the latter half, this book aims to deepen the reader's understanding on an even more comprehensive level by introducing case examples.

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