Information and Computer Sciences Viewed From the Principles of the Coreation

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Ⅰ. Foreword

Within the context of 'God-nature-man', we can tell that man's system of knowledge has been perfected through various channels according to the flow of the times of human society. The model of a knowledge system, commonly known as natural science, was formed in the seventeenth century. Despite differences in formalities and thoughts, we cannot deny that it was a significant period which determined modern and pre-modern sciences.

Can we grasp the truth based on man's reasoning? Or is it possible only within God's existence? By linking the truth within the mind of the omniscient and omnipotent Absolute Being to that of mankind, scientific phenomena are shifted from faith to rationality, from church to laboratory. Human history has established itself with the central methodology of today's modern science and led to the formation of a new knowledge system called technology based on man's knowledge and intelligence. An event of the twentieth century.

In the general introduction of the Divine Principle, it says, "From the earliest dawn of history to the present, men have constantly and earnestly searched for the truth with which to overcome this ignorance and restore the light of knowledge. Man has struggled to discover internal truth through the way of religion. Science has been the path taken toward the discovery of external truth." It concludes that "The day must come when religion and science advance in one united way...Then, mutual understanding will occur between the two aspects of truth, the internal and the external."

If so, we need to resolve the issue of being able to expound religion and science simultaneously. Indeed, is it possible? If the objects of science are divided into 'science centering on nature', 'science centering on man' and 'science centering on God' as today, can we explain with one theory the reality which is understood to be first, natural science, second, human science, and third, theology? Surely this is an extremely difficult task. It will be even more difficult under the combined definition of both metaphysics and physical science, which states that explaining things which should not be explained is the role of religionists, that which are unexplainable is the role of philosophers and that which are explainable is the role of scientists.

Moreover, how should we, within the context of 'God-nature-man', shed light upon the new culture and civilization that mankind has created? Focussing on how a religious doctrine, the Divine Principle, is able to elucidate the new civilization and cultural age that mankind has created, my research will try to throw light on the keyword, 'information society', of the new human society, the computer, the tool of living in that society, and its system of study, information and computer sciences.

Ⅱ. The Principle of the Creation and Human Society

In the Unification Principle, the dual characteristics are considered to be the common denominator of 'God-nature-man'. All things created by God resemble the dual characteristics of God, who is the invisible subject, and God's substantial object is the nucleus of the creation. The Principle defines such a substantial object as an individual truth body. Hence man, being the image substantial object of God, is defined as the image individual truth body, and all other created things other than man, being symbolic substantial objects of God, are defined as symbolic individual truth bodies.

Then what are the things of creation made by man who inherits God's internal character, and in what manner are they being shaped? If the fact that they were substantiated based on technology, which is the product of man's knowledge and intelligence, and that they satisfy the requisites as God's dual characteristics and truth bodies in man's artificial tools were known, do we not have to interpret it that man has merely re-created symbolic individual truth bodies (even if they are of poor quality) in accordance with God's Principle of the Creation and that he manages the human society all by himself

according to God's planned schedule? Man is expressing the society that he has created with the general keyword, 'culture and civilization'.

The classification into hunting society, agricultural society, industrial society and information society begins with the necessity of tools in men's day-to-day living. For instance, spears and arrows in a hunting society; labor force, farming equipment and water in an agricultural society; matter and energy in an industrial society; information and computers in an information society. The modern convenience of civilization for every epoch differs in its nature of use and is related to the affluence of human lives according to the benefits of that civilization.

Ⅲ. The Completed Testament Age and Information Society

The Completed Testament Age literally means the age of fulfilling promises, one in which a covenant has been made with God, who propagates His Will with new words of truth by dividing the developing human society into the Old and New Testament Ages from a religious viewpoint. On the one hand, humankind defines the new society as an 'information society.'

What is information then? As the term 'information society, information industry' denotes, there is a flood of information in the present age. Furthermore, the meaning of the word 'information' itself is vague and hardly definable enough to be used all the time. It is being used as an abstract concept to stand for a contemporary society. It has been lexically defined as having a great social value more than matter or energy.

Tracing the history of information is also another purpose of this research work. Translating the English word 'information' into Chinese characters in 1879, Huguja Yukichi became the first user of that word. It bears a common meaning in countries which utilize Chinese characters, such as Korea, Japan and China. 'Information' originates from a word with Latin form. In 1928, an American scientist, Hartley, used the word for the first time in his "Transmission of Information" with the same meaning as today.

The latest interpretation of the word 'information' is given by the former director of the Advanced Technology Research Institute of Tokyo University, Mr. Murikami Yoichiro. He defines 'information' as the 'transmission of meaning' and regardless of its subjective meaning, defines the objective qualification of information as the

essence of information science. However, since either definition is understandable to any expert in information, not only are they unconvincing but also too abstract. As explained above, the etymology of 'information' is 'to have a form'. We need a basic understanding and a cognitive method rather than what kind of form it should take. Where on earth is information then?

1. Location of information

Information exists in all objects which are distinguishable with man's intelligence, emotion and will. That is to say, they possess their own kind of information as long as they are God's Creation, both living and non-living things. Each piece of information has a value, too. Of course that value is determined by man's standard of value. The judgement of value for God's Creation is also determined according to man's standard.

2. Beginning of information

The 'information' that we always make use of today is most appropriate for the current state of affairs. The first country in human history which disclosed it was Korea, but very few people actually knew it occurred in 1443, which was more than 550 years ago. The design of 'information' and the start of its usage can be traced back to the time of King Sejong's reign. '*Jeong*(正)' means 'meaning' and its first literature can be found in the Korean annotated edition of *Hun-min Jeong-eum* (an old name for the Korean alphabets). The meaning of the Chinese character 'jeong' is common in the three oriental countries, but only Korea clarified that it denoted 'meaning'. We discover the source of 'information' from the word 'shinjeong' ('to spread the meaning'). Instead of a society which makes the meaning known, one which spreads the meaning will lead a positive society centering on human beings. An 'information society' means 'a society which spreads the meaning' and 'information technology' means 'technology which spreads and tells the meaning'.

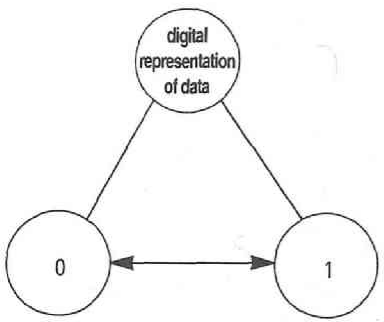
3. Method of Representing Information

The external form is differentiated from the internal character even in information. The external form of information refers to the method of representing information externally, whereas the internal character of information refers to the form that cognizes and comprehends with man's internal attributes of intelligence, emotion and will. There are two forms of representations—the analog and the

digital—in the method of representing the external form of information. Both methods represent numerical information. Analog means 'continuous'. Everything that man perceives, for example writing on a piece of paper, sound heard by human ears or things seen by human eyes, is analog representation. On one hand, digital numerically expresses all information as 'zeroes' and 'ones'. Converting continuous analog values into 'zeroes' and 'ones' is called digitalization. Such a digitalization process has already been organized based on exact mathematical formulae. In the Divine Principle terms, it means the entire universe can be numerically expressed by the dual characteristics of 'zeroes' and 'ones'.

Why is it feasible then? Such a conversion process has simply been discovered in information and computer sciences but no fundamental explanation has been offered. The Principle of the Creation says, "Everything exists through a reciprocal relationship between the dual characteristics of internal character and external form. And everything in the creation exists only because of a mutual relationship between its dual characteristics of positivity and negativity." In other words, since all the things of creation take after God's dual characteristics, we reach the conclusion that the Creation can be regarded as the dual characteristics of the digital values of zeroes and ones. By explaining the digitalization of information from an ontological viewpoint, it also serves to prove that the Principle of the Creation is not a commonplace theory.

On the other hand, the internal character of information again accomplishes its dual characteristics through syntax and semantics. The Principle of the Creation has repeatedly emphasized man's internal attributes of intelligence, emotion and will with which the internal character of information cognizes and comprehends. The external expressions of intelligence, emotion and will appear in the form of languages, pictures and music. We call these media of expressions multimedia. Each medium has a different form of expressions. That means syntax and semantics are not the same. The syntax and semantics of intelligence, emotion and will can also be digitalized. The digitalization of information has a close relationship with the computer,

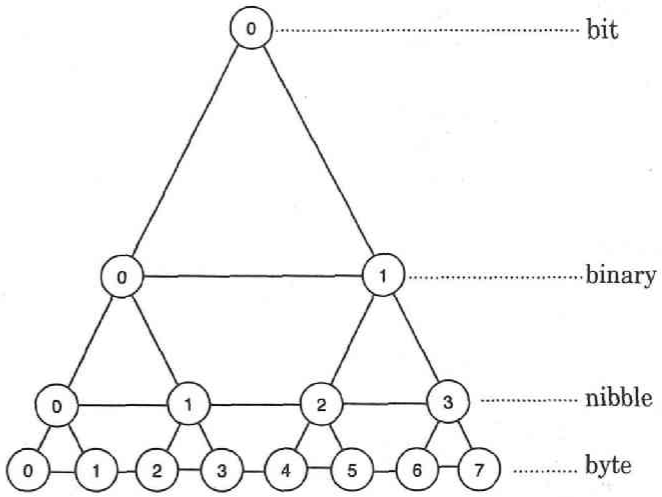


the machine that man has invented. From a scientific sense, digitalization is a method of representing information inside a computer. Therefore whatever computer information it may be, it is represented by the dual characteristics of zeroes and ones. Information processing, storage and exchange are performed within a computer by such dual characteristics.

4. Unit of Information

We call the smallest unit of representing digital information a bit and we can represent the dual characteristics with one bit. We start out to represent information of zeroes and ones with the smallest unit and after combining eight bits, a byte is used as the next unit of representing information. Needless to say, it is a compulsory basic unit. In the Principle of the Creation, there is an explanation on the giving and receiving relationship. "When the subject and object aspects within a being and between beings are engaged in a good reciprocal relationship initiated by the Universal Prime Force, all the energy necessary for its existence, reproduction and action is generated. The process which produces the necessary energy is called give-and-take action."

If we substitute the above proposition with the representation of information, then information ought to be generated within the context of 'God-nature-man', and information representation, processing and distribution will be carried out with the unit of dual characteristics. Likewise, we can say that the process which animates information is



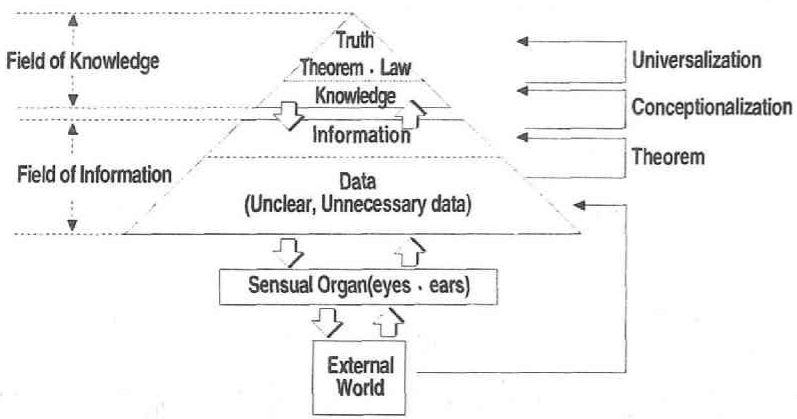
the consequence of the give-and-take cooperative action of digital.

The bit, the smallest unit of representing information, splits into two (binary), four (nibble) or eight (byte) units. Eight bits recombine to form a byte. Although the objects are different, the forces of the give-and-take cooperative action for bits cause the multiplication action and increase the units of representating information, which then re-synthesize into a larger unit and the process of byte formation occurs. This has something in common with the origin-division-union action of the Principle of the Creation. According to the Principle of the Creation, the give-and-take action of the dual characteristics must be accompanied with a definite central result. When the heart is at the center, the fruit or resulting union is a composite body or a unified body. When the purpose (the Principle of the Creation) is the center, the fruit is a newly-formed body or a multiplied body.

If we try to explain the digital representation of information with the above Principle of the Creation, give-and-Receive action of the dual characteristics known as digitalization, centering on a certain purpose which appears in the form of a receptacle of a new dimension for filling information, continually multiplies that receptacle into a new one which contains more information. The product is a newly-formed body of new information or the form of a multiplied body.

5. Perfected Information Becomes Universal Knowledge and Common Sense

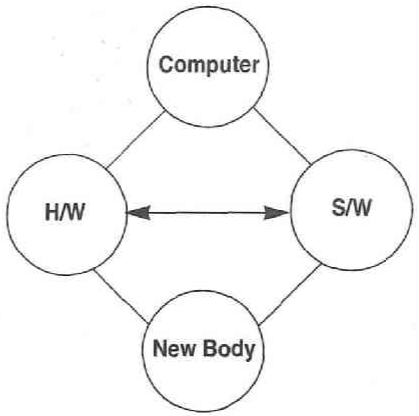
On perfection, information becomes universal knowledge and common sense. Depending on the types of stimuli received from the external world (or secondary environment), human beings differentiate them



into data, information and knowledge. They are structuralized. 'Information' is data obtained from the environment, selected and processed by human beings. It becomes 'knowledge' when conceptualized or systematized. Also, when subject to the universalization process, knowledge further becomes 'truth, theorem and laws'.No matter how wonderful a doctrine or teachings may be, they are just data to a layman or a non-specialist. If they are meaningful data, they become information. The systematization process of information results in knowledge, which becomes truth when universalized and theorized.Are religious doctrines data, information, knowledge or truth? Must they exist only in a man's belief? If so, where does the Principle stand?

Ⅳ. The Birth of Computers

Today's computers can perform computations, think logically and give the correct solution of a given problem by analyzing it. That is because today's computers are machines modeled after man's information processing mode. Let us briefly look back on the history of computers.



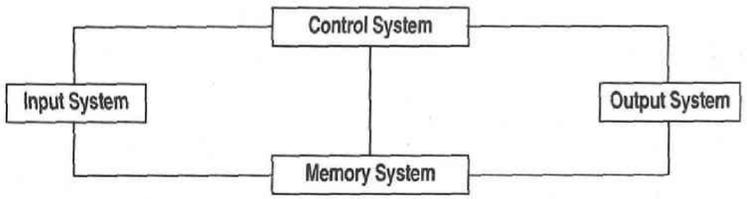
Man's dream of creating an adding machine that resembled himself was realized by geniuses starting with Pascal. Influenced by Hobs and Descartes, Leibnitz, a famous philosopher and mathematician, tried inventing a language that represented meanings in man's information (that is, man's concepts of thoughts) with universal symbols, as well as a symbol-processing machine that performed calculations between those concepts by the inference method. However, he could not fulfil that dream due to the rudimentary technological methods in those days.

In 1936, an English mathematician, Turing, by defining man's information processing in mathematical terms, propounded the 'theory of the possibility of calculations'. His theory mathematically

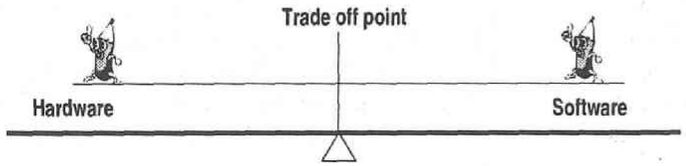
proved the possibility of solving problems with a simple machine, the Turing machine, by providing it with a certain sequence for solving problems if man is already familiar with the solutions of the problems, that is, if they are problems with algorithm in computer science. The Turing machine was merely an abstract machine, but the earliest computer ENIAC made its first appearance in 1946. Later, owing to the innovative development in the electronic field like the transistor integrated circuits (IC) and the early integrated circuits (VLSI), it grew into today's computers.

The reason for citing atomic energy and computers as representing the human civilization of the twentieth century is that they contribute greatly to the human civilization. Both external form and internal character do exist in the composition of man. We call the former hardware and the latter software. Similarly, a computer comprises hardware and software.

A computer needs both hardware and software to process some given information. Computer processing means performing it by the joint tasks of hardware and software. It is the same as the Principle of Give-and-Recieive Action. As compared to man, computer hardware corresponds to his body and computer software corresponds to his intelligence, emotion and will. To execute all system functions, a computer system coordinates the various processing units. It combines the partial mechanism under a certain design idea and materializes a complex mechanism. We can call it a kind of 'architecture'. The design idea takes control of the functional and the



Hardware Units of a Computer



artistic values of the architecture. Hence when designing the architecture (computer), the computer architecture is the design idea or guide that must be established first and foremost.

As I mentioned earlier, computer science consists of functions executed by hardware and those executed by software. Computer hardware refers to those mechanism or functions made up of electronic parts and electronic circuits. It literally means 'something hard and solid'. So once the hardware functions have been constituted, they cannot be easily changed. On one hand, computer software refers to those mechanism or functions executed by computer programs, which are composed of commands and data input into the computer. It has the literal meaning of 'something soft', so it is relatively easy to alter the software functions. In order for a computer to perform its functions, the dual characteristics of hardware and software are actualized based on their reciprocal relationship and cooperative operations. Computational results are merely produced by the give-and-take action of hardware and software.

A significant aim in the design of a computer system is to locate a well-balanced point between hardware and software. In sharing out the work load, both hardware and software are in a concurrent relationship. We call such a relationship a tradeoff. We define tradeoff as work done so as to mutually strike a balance through proper adjustment of the concurrent relationship, and the state of balance as the tradeoff point. If we obtain this tradeoff point, processing can be performed by fair load division. The strongest point of the give-and-take action is the tradeoff point.

Ⅴ. The Generation Theory of Computers

The generation theory exists even in computers. The different computer generations are classified according to the progress of computer technology.

(1) logic elements
(2) memory elements
(3) programming languages
(4) operating systems

Depending on the generation, (1) and (2) become the foundational technology necessary to perform hardware functions, while (3) and (4) become the foundational technology necessary to perform

software functions as the most up-to-date technology.

1. First Generation Computers (1940~1950)

① Electronic adding machines which used vacuum tubes as logic elements were presented based on the principle of mechanical adding machines which used relays as elements consisting of logic. This was the period in which the original form of modern computers came into being. We now call the electronic adding machines 'computers'.
② Cathode-ray tubes were employed as elements consisting of the earliest computer memory. Magnetic drum units, that is, magnetic core memory unit or rotary memory unit which used magnetic substances as storage media, were subsequently developed.
③ High-level programming languages had not yet appeared and assembly programming based on the assembly language which used machine commands directly came into use.
④ The public ownership or popularization of various hardware and software parts which constituted a computer system had not been achieved. Due to the one-man-user computer system and its utility mode that could only perform discontinuous processing, an operating system was not necessary.

2. Second Generation Computers (1950~1960)

① Transistors and diodes invented in 1948 differentiated the computers of this generation.
② Storage units were chiefly utilized as magnetic core memory units which appeared in the latter half of the first generation.
③ High-level programming languages such as FORTRAN, ALGOL and COBOL were put to use for the very first time.
④ An exclusive system for batch processing, which accepted multiple tasks but processed each in sequence, was mainly used.

3. Third Generation Computers (1960~1970)

① Logic circuits which made up a computer became the IC that integrated and mounted transistors on semi-conductor chips.
② In the second half of 1960, the number of storage units which constituted the main memory unit was changed from core memory to IC memory.
③ FORTRAN was continuously used as a programming language for scientific use and COBOL for office use.
④ From the second half of 1960, the operating system which pointed towards a timesharing system (TSS) processing made its debut. TSS shared the computer resources by time partition.

4. Fourth Generation Computers (1970~1980)

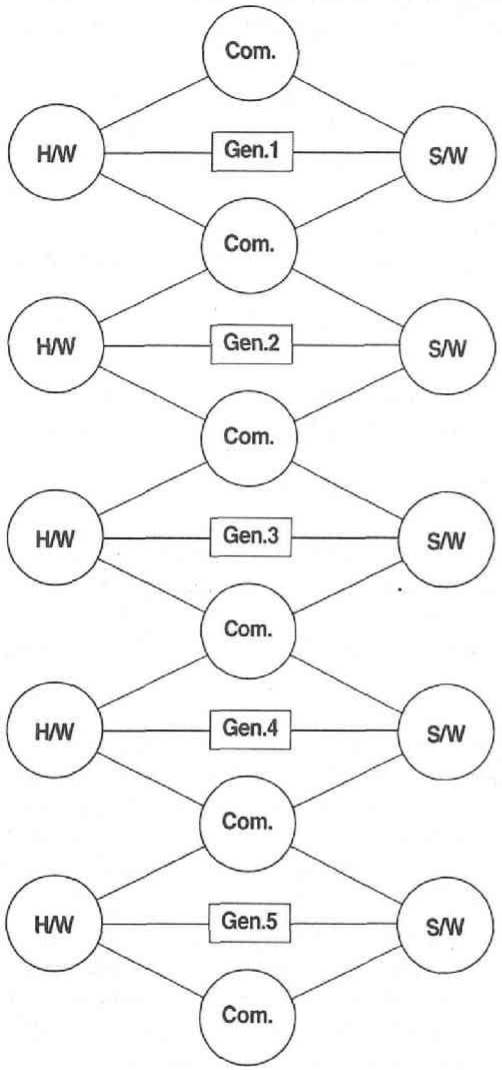
① VLSI that integrated and mounted millions of transistors appeared.
② Due to high integration of memory IC elements, the memory capacity reached a few megabytes.
③ BASIC programming and C language for PC use appeared and pervaded.
④ ÍOS for PC use and UNIX for WS use appeared.

5. Fifth Generation Computers (1980~1990)

① ULSI that mounted millions of transistors on one single chip was universalized.
② The capacity of the main memory unit was increased to a few gigabytes.
③ Apart from the mediocre high-level programming languages, programming for processing symbols (e.g. PROLOG, LISP, etc.) came into wide use.
④ The distributed OS and the OS for parallel-processing use were developed.

As shown in the above, we can classify the computer generations according to the progress of computer hardware and software and trace the technological development in the following diagram.

From the above diagram, we can tell that the computer generation theory resembles the origin-division-union action and is being evolved. The reason is that computers are machines which are like man. The Principle of the Creation states, "Through the origin-division-union action, when the origin is divided into two substantial objects, they assume the roles of subject and object respectively and finally unite into one body. Thus the three objects purpose is fulfilled. Since the three objects purpose is centered on the origin, the four position foundation is formed." It also says that the four position foundation is God's eternal purpose of creation. Man has created the computer which bears resemblance to him, for the purpose of enriching his life. It stems from the necessity of an instrument to produce, process, distribute and preserve all information. Technological development offers man a new opportunity, a new society known as the information society. The standpoint of whether the information



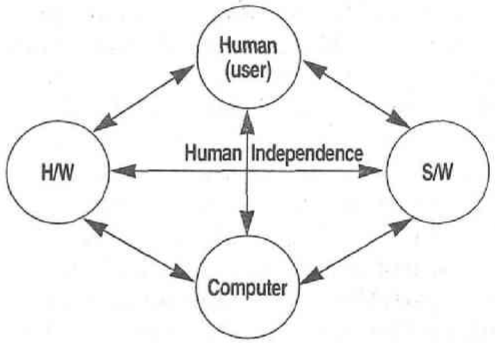
Flow of the Computer Generation Theory

society is accomplished owing to man's effort only or the Creator, God's predetermined event can turn into a subject for argument again. But the advent of a new human society can be foreseen and

explained with the doctrine of one religion. Whether a person believes in a religious dogma or in his own knowledge, is it not an appropriate time now to have a new perception on the Principle of the Creation?

Ⅵ. Objectives of Information Science

The target for the future technology of computers is in the machine which resembles mankind. This is unchangeable in the past or present. The world's trend generally regards information science as the superior concept of computer science. The reason is that the word 'information' is universal within the context of 'God-nature-man'. As



mentioned earlier, since 'information' means 'to spread the meaning', discovering God's Will in nature belongs to the field of natural science. If we examine the doctrine which says that God's Will has to be inherited by man, we should search for the existence of God in man's information science.

The objectives of information science are as follows. First, to focus our attention on the overall highest intellectual faculty among man's activities for information, which is man's creativity, and to analyze it. Secondly, to develop a technology which explains how man's creativity can reappear in the artificial machine called the computer. Learning, cognition, generation of knowledge, extraction, and so forth are found in the faculty consisting of creativity. God endows only man, the external individual truth body, with such human creativity.

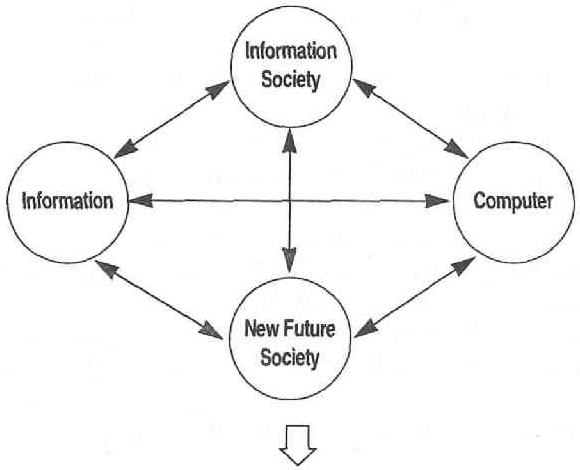
Therefore if man should create a machine which resembles himself,

he will aim for a computer which possesses the ability endowed by God. In reality, all the world's information-and-computer-related scholars are setting a goal for this development. As we can tell from the above diagram, the resultant can either be a smart robot known as the computer which resembles man himself, or a computer that is able to perceive and comprehend man's five or even six senses. Every nation of the world is in keen competition with one another for the development of such a computer technology. How shall we explain computer technology, which is comparable to the consummation of the four position foundation?

Ⅶ. Future Works

Even though we start off with a system of proofs that enables us to produce real evidence for God's existence from man and nature, accepting the Principle of the Creation as a believer's faith and conviction which conforms to the authority of religious doctrines is from the viewpoint of pagans. In this research paper, in order to further universalize the Principle of the Creation, I intend to account for the world of 'information' and 'computer' from the perspective of the Principle of the Creation in a new human society, the information society, with an endeavor to guide the general theories.

Although it is possible for someone to explain a similar phenomenon with the Principle of the Creation, I see it as an accidental



generalization from a negative aspect. We obtain the same kind of effect from the cause with a homogeneous structure and composition, though. From a reductive standpoint of scientific theories (i.e. same cause, same effect), our explanation is by no means wrong.I acknowledge that there is a problem in the depth of our religious faith or system of knowledge in explaining all sections of the stupendous scope of information and computer sciences with only a superficial understanding of the Principle of the Creation. However, it is only the beginning of our attempt.

Why should we concern ourselves with information and computer sciences? Why should they be the main objects of the goal of our education? If it is possible to establish a theory that gives an intrinsic explanation, not only are we able to claim the Principle of the Creation as a 'bridging principle' which explains the general and universal principles of specific science from a religious dogma, but it is also the first step toward a revolution of religious customs and practices, which is the transformation of common religious rites into truth. Mankind has made a new society. The current society may be an information society, but what will the future human society be? Whatever that society may be called, it is obvious that the information society of today will be its foundation. Is it worthwhile to dispute whether the future society is charted in God's timetable or based on man's foreknowledge? Or should we deem it a matter of faith and conviction?

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