

ON COMMUNICATION QUALITY

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Abstract

At the human communication, differences of the culture or the background knowledge make the recipient not to understand correctly the communicator's intention. The paper tries to analyze why the Japanese are inscrutable by introducing study reports on the Japanese conversation custom statistic, the Zen philosophy ranking the verbal message low, and the medical study of the Japanese speaking people's brain. How to improve the communication quality is discussed, and the three approaches are evaluated which are computer communication media under the globally common definitions of functions, associated information retrieval methods to detect the background knowledge differences, and a quality guide file of the internet web information. Also, it is pointed out that the human used and will use two types of messages, one aims to be understood universally and the other to be understood only by some restricted people.

I. Introduction

Here, "communication" is defined as all behavior between humans that seeks to communicate thought. On the other hand, the term "telecommunication" can be used when referring to communication within a narrower meaning in the field of telecommunication engineering, to distinguish between the two.

Communication quality represents the "degree of understanding intention", or more precisely, the extent to which the recipient correctly understands the intention of the communicator. In comparison, transmission quality in telecommunications is evaluated by the electrical or physical reproduction rate of the transmission message. After World War II, the issue of intercultural communication was researched mainly in the United States in such fields as social sciences, psychology, linguistics, and philosophy. This research pointed out that differences in culture, customs, and background knowledge between the communicator and the recipient of the message lead to misunderstandings, but this problem is not limited to intercultural situations, being shared to some extent by people in general. To the author's knowledge, this research is of the statistical and phenomenological analytical kind. [1] [2]

Practical research that undertakes to improve the understanding of intention has been extremely scarce, confined to orientation training systems (cultural assimilators) for people being dispatched abroad or to educational programs that rely on case studies. In addition, most of the publications available are either simply compilations of case studies or philosophical

discussions far from practical use. This issue needs to be discussed on an interdisciplinary basis, considering the past few years which have seen the following changes in social conditions:

A. Independently from the above sort of discussions in social sciences, natural scientists are now involving themselves in the area of communications efficiency between humans through the practical use of computer communications based on know-how in traditional information technologies.

B. The workings of the brain are beginning to be explained by the chemistry and medical fields.

C. After going through a period of introspection, research into machine translation has quieted down. A complete stop to this research would be regrettable.

D. Once telecommunications around the world is converted to digital systems ensuring zero transmission errors, we will be entering an era that places greater emphasis on the quality of content that, through multimedia, makes full use of the human visual and aural senses.

II. *Overview*

(1) Motivation and methods in communication

Communication sometimes has the goal of transmitting or receiving information and sometimes it has the goal of maintaining social relationships through the simple exchange of appropriate greetings. [3] Even in the latter case, in which the communicator behaves with the goal of creating a good relationship with the other party, there is some measure of intention involved in the communicator's message and the effects of that intention need to be evaluated. The expression of the message can take many forms besides verbal, including visual images, gestures, looks, face color, or contact. Communication can be face to face or through media such as telecommunications, pictures, and printed materials.

(2) Degree of understanding intention

It is not uncommon in communications for the message of the communicator to be communicated incorrectly. Figure 1 shows this concept in graphic form. The degree of understanding intention is defined as the extent to which the recipient has correctly understood the intention of the communicator. It is generally difficult to measure the degree of understanding intention, and this is attempted, for example, in classroom lectures and exams at school.

The reasons why a message is not correctly communicated from communicator to recipient depend not simply on differences in background knowledge, culture, values, etc., but also on whether the message faithfully expresses the intention of the communicator.

(3) Communication models

Shannon's model (Fig. 2) is well known in the field of telecommunications. [4] In the

FIG. 1 DEGREE OF UNDERSTANDING INTENTION IN COMMUNICATION

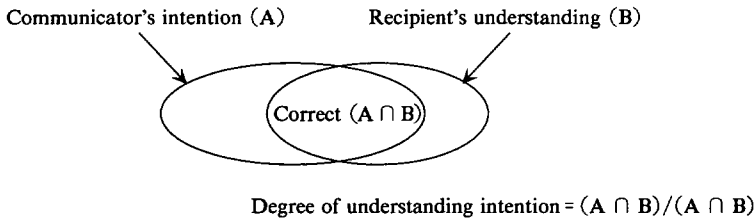
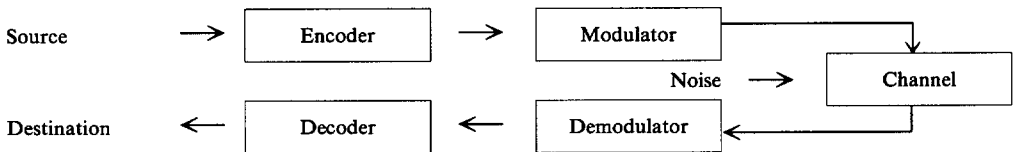


FIG. 2 SHANNON'S COMMUNICATION MODEL (1948)



Shannon's model, the key point is how the message transmitted from a person through a channel such as sound waves is faithfully reproduced in its original form near the ear of the destination (recipient) of the message. The semantic preoccupation of whether the intention of the communicator has been correctly understood by the recipient is outside these parameters.

A bit later in the field of social sciences, Schramm, who was influenced by the pioneering work of Saussure [5], provided us in 1954 with the loop model shown in Fig. 3 concerning the process of message restoration and interpretation.[6] While the process of understanding words is discussed in a philosophical manner in cognitive and other sciences, we still do not have a full understanding of brain processes. It is therefore easy to understand why the "interpreted object" box included in the Schramm model cannot be expanded much further than this.

The eastern Zen philosophy says that the best quality of human knowledge comes from doing, the second from seeing and the third is from words. In other words of the Zen teachings, the truth can not be expressed in words. An information processing model of the human brain can be found in the ideas of the Zen. Figure 4 is a human information processing model produced by physicist Masakazu Nakayama as an interpretation of the Zen teachings found in Shoho Ganzō.[7][8] In recent years, more light has been shed by medical or chemical researchers on the workings of the right brain and left brain, and the fact that both brains communicate through a bridge with each other is the object of much interest when compared with the Zen model.. It can be considered that Zen thinking, which makes so little of words, theories, and written texts, has influenced Japanese culture, which ranks the spoken word low as a means of communication, as mentioned in the section below.

(4) Verbal and non-verbal messages

As demonstrated by sayings such as "One look can speak a thousand words," "The eyes speak more than the mouth," and "Beyond words," the power of non-verbal communication has long been respected. In an experiment undertaken in the United States, it is shown that only 35% of interpersonal communication consisted of verbal messages with the remainder

FIG. 3 SCHRAMM'S COMMUNICATION MODEL (1954)

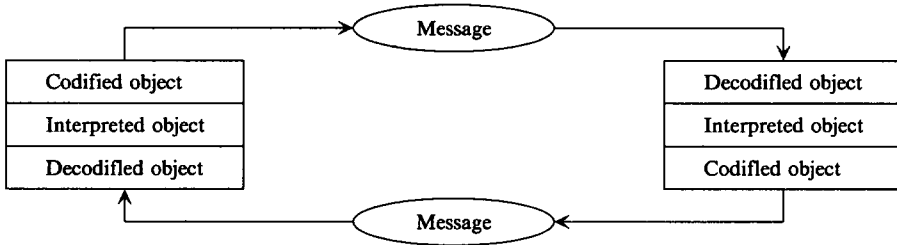
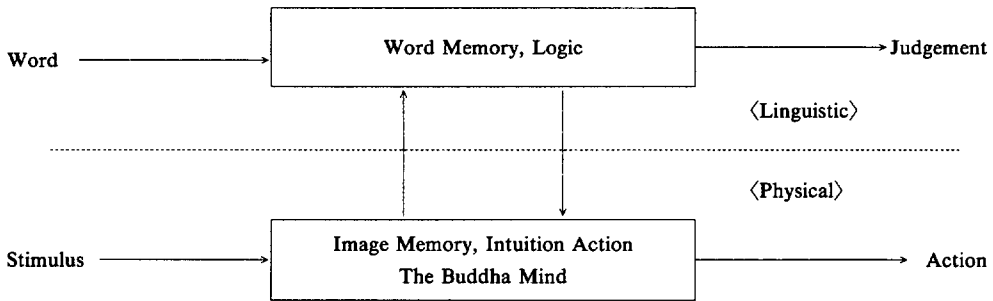


FIG. 4 HUMAN INFORMATION PROCESSING MODEL IN ZEN



being non-verbal messages. [9] Another report states that 7% of interpersonal expression consists of words, 38% of intonation, and 55% of facial expression. [10]

These data indicate that the percentage of communication using verbal messages is low in the United States, but in Japan, there is even less use of the spoken word. In a report by Ishii et al., it is shown that Japanese people spend half the time in conversation per day than Americans do. [11]

Japanese people's capacity for non-verbal communication such as facial expressions and gestures is also said to be low. This poor message communication ability is probably why the Japanese are said to be inscrutable.

In Figure 1, the optional area where the two ovals do not overlap that belongs to both communicator and recipient is viewed differently in Japan and the West. For example, in the West when someone does not understand the content of a presentation or lecture, they might say "I cannot understand," placing the speaker in a defensive position. But in Japan, many people see it as embarrassing to express the fact that they cannot understand something. In communication, the degree of understanding intention rests on the ability of the communicator in western culture, while in Japan, the degree of understanding intention rests on the ability of the recipient to guess. This reflects the tradition where by remaining silent and showing no facial expression is considered a virtue.

(5) Visual and aural receiving capacity

In airplanes, one is inevitably disappointed by the discrepancy between the anticipation of good food as suggested by the menu and the actual meal delivered to one's seat. On the other hand, there is little misunderstanding when purchasing a box lunch from a railway station

stand where samples are on display. Based on these experiences, if you regard human hearing and vision as receptors, the latter appears to be the superior receptor. In medical terms, while human hearing receives 20 to 20KHz sound waves by mechanically vibrating a single eardrum membrane, we know that our sense of vision works by the photoelectric conversion of about 10^{15} Hz visible light rays in parallel using 100 million sight cells. In contrast to the voices we hear every day, which converted to digital would be at a speed of around 50 bps, television images even when compressed using the latest MPEG scheme are received at a digital speed of 1.5 Mbps. This works out as a 30,000-times difference between hearing and seeing. Since we are still not clear about how the brain actually records and uses information, we cannot state that there is a link between these differences in reception capacity and differences in the degree of understanding intention. However, since we read several times faster silently than we do out loud, we can clearly state that sight is a faster means of reception of messages than sound.

(6) Pictorial messages

An example of visual messages is the cave drawings at Altamira which convey to us some idea of life in prehistoric times. Generally speaking, most people when they stand in front of a picture ask themselves what it means. In this way, the concrete picture becomes a message that conveys whatever the artist saw in front of him or her. Abstract paintings are somewhat harder to understand as they convey the sentiment of the artist to the recipient rather than the message of a concrete scene.

Even a person who is unskilled at drawing can draw a map of how to get somewhere. Nevertheless, directions to someplace will often be received from Europeans or Americans in the form of a written description as opposed to drawing a picture. They are usually written in a brief but easy-to-understand manner. Such people might think that Japanese are not good at recognizing the written word, but from our point of view as Japanese, they appear somewhat unkind. This is another example of differences in dependency on words.

(7) Import of language-dependent systems

In international or personal relations when things are smooth, most misunderstandings in verbal communication are overlooked and action makes up for any lack in communication. But when a particularly distressing event occurs, we must be aware of the fact that preference is given to rhetoric-like verbal communication. At times like these, people need to choose words very carefully, bearing logic in mind. A typical example of this is the legal proceedings between a prosecutor and defendant. Since western legal systems were imported after the Meiji era, the Japanese, who are not normally verbal people, have followed western legal customs that require lengthy discussions and huge volumes of text. This import of western practices can also be seen in the Diet and in shareholders' meetings. Nevertheless, Japanese tend to avoid verbal conflict as much as possible, and despite the introduction of such systems, the national character of Japanese people is such that there is still a paucity of lawyers, Diet discussions are somewhat subdued, and 'sokaiya' agents are even sometimes hired to prevent arguments from breaking out at shareholder meetings. If A and B from Japan were to attend an international conference, and A were to vociferously contend the opinions of the other country while B were to remain silent from beginning to end, A would be popular at the party afterwards while no

one would approach B. In the West, holding fierce discussions is rather like an exciting rally in a game of tennis and is looked on as praiseworthy behavior that leads to the formation of friendships. Japanese people give precedence to the idea that spontaneous argument sometimes destroys friendships. Cerebral physiologists have defined this as the difference in roles between the left brain and the right brain. [13] [14] [15] That is to say, Western people process logical linguistic activities in the left brain while their right brain is used for emotional expressions that appeal to the sensibilities (crying, sighing). The Japanese on the other hand, process both types of activities in the left brain, explaining why linguistic activities influence their emotions. The discovery of this structure whereby heard information is processed separately in the right and left brains was largely dependent on the Tsunoda Test devised by Tadanobu Tsunoda. [12] This test also established the fact that the human brain unconsciously receives warning information that emanates from underground before an earthquake. It seems that the ability to switch processing between right and left brains depending on the shape of the sound waves, in other words a switcher feature, is not determined by race or genes but is controlled by the linguistic environment in which one is reared. This was also made clear using the Tsunoda Test. So, the brain of Japanese people who were reared in Brazil or the United States as speakers of the local language will show the same functional division of brain roles as that of local people. On the other hand, Americans or Europeans raised in a Japanese-speaking environment become linguistic sentimentalists just like the Japanese.

(8) Multimedia

Multimedia grew to boom proportions from the 1990's, due to massive promotion on the production side (from producers and providers). In recent years, with the exponential increase in semiconductors and optical fiber materials as a backdrop, the computer industry increasingly downsized and the telecommunication industry equipped with fiber lines, has been facing a situation of surplus supply. Now, it is at the stage where no further expansion is foreseeable beyond handling of video products that consume enormous amounts of digital data. When Vice President Al Gore, fired by NTT's 21st Century VI&P vision, initiated a plan to construct a gigabit network, Congress pointed out that it did not see the need for a \$400 billion investment, and even funding for application R&D in the 1994 fiscal year subsidy budget was cut to 1/4 of the \$100 million proposed. In Japan, at one stage, a day would not pass without the word "multimedia" being mentioned in some newspaper, and with its description as media that combined video, audio, and text, it is little wonder that the public did not see any difference between this and television. It's hard to understand why so much excitement was made over VOD (video on demand) and videophones at that time. It was after the start of the multimedia boom that the Internet exploded and people began to take an interest. The Internet rescued the state of multimedia, which had been weak in terms of practical business applications.

The computer industry was the first to show business results with multimedia advertising. Recent computer software which is not essential but which includes graphics stimulated users to upgrade equipment from an inadequate 16 Mb memory to speed up display time. The telecommunications industry jumped on the Internet bandwagon from 1996, and while it has not gone as far as laying optical fiber cables, is starting to respond actively to demand for the home use ISDN in Japan.

III. *Tool Developments*

Now it's time to take a look at the tools being developed to actively improve the degree of understanding intention in communications. Either spurred on by the research into intercultural communications in social sciences as mentioned earlier, or ignorant of it, fields such as computer science and telecommunications engineering have started to develop and create tools that can assist in improving the degree of understanding intention. We can anticipate tools that we can begin to use soon. The following is a look at ways to improve understanding intention in communication that include these tools.

(1) **Communication via artificial language**

Language type messages can be finely divided into natural language type messages and artificial language type messages. In the social sciences, discussions are confined to the use of natural languages, but in today's society, the use of artificial language for inter-computer communications has become the norm. We cannot but acknowledge the fact that this type of artificial communication is used for communication between computers and not between humans. This is because behind each computer is a human communicator and a human recipient who are merely using the computer as a tool like a telephone to encode and transmit the information (Fig. 5).

In artificial language, the meaning of the words is strictly defined. At each terminal, the words are converted at an interface for the human in accordance with that definition. Therefore the degree of understanding intention as defined in Figure 1 above, is closest to 1. The meaning of being close to 1 and not being 1 itself is that humans sometimes make mistakes when operating the interface. Because definitions are so strict in artificial language, the function of expression is also limited. This means that in the area of CAD that uses an artificial language limited to automobile or semiconductor design, the design team from this company can have efficient and excellent communications with an overseas plant. Application of this tool is continuing to grow in the fields of banking, trading, logistics, POS (point-of-sale), and electronic commerce, and this allows global communication with a high degree of understanding intention within the range of this function.

The economic benefits to be gained from establishing this type of artificial language environment are visible. The plots in Figure 6 show the GNP per population by country on the horizontal axis versus the rate of use of personal computers and telephone lines and electricity consumed per population on the vertical axis. This data is based on 1994 ITU statistics[16] and the Britannica International Yearbook[17]. The rank correlation coefficient obtained from the data shows a high correlation between widespread use of computer communications and GNP at 0.927, which is much greater than the rank correlation rating of 0.877 for the

FIG. 5 COMMUNICATION MODEL USING COMPUTERS

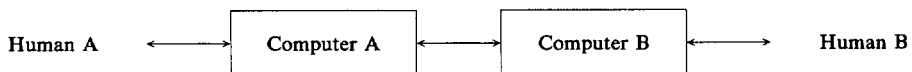
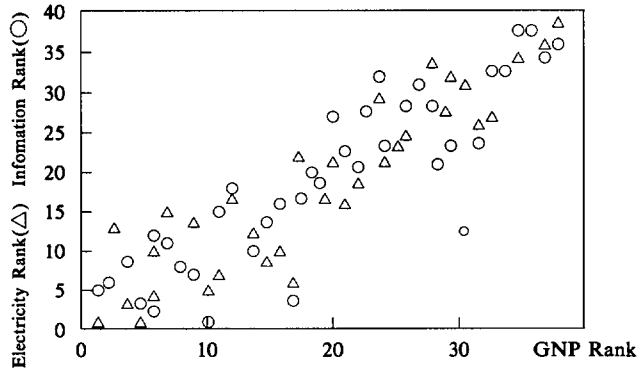


FIG. 6 GNP RANK CORRELATION WITH INFORMATION AND ELECTRIC POWER BY COUNTRY



correlation between electricity consumed and GNP. Because the scale of the telecommunications industry and personal computer industry makes up only a small percentage of GNP, we can conclude that this high correlation with GNP is due to the positive effect that the convenience of communication tools gives to other industries.

If natural language is a culture-dependent communication medium, artificial language is a civilization-dependent medium. The function of artificial language is still restricted but future standardization and progress in software development will no doubt lead it to gradually invade the territory of natural language communication.

(2) Tools for natural language communication

The distortion of understanding that arises between the sender and receiver during language communication arises because of differences in past memories associated by both parties with the message. Each word expresses the concepts of that word using a multi-dimensional meaning vector. There has been progress recently in trials that use collections of these vectors as their concept base in the fields of linguistics and computer science. Different researchers have different methods for calculating these multi-dimensional meaning vectors.

NTT Communication Science Laboratories have been using a Japanese language dictionary [18] as a source of material for the Japanese language. For example, under the item "horse" appear basic words such as livestock, cultivation, racehorse, chess, and keima. If we look up another dictionary, horse is defined using the words livestock, herbivorous, hoof, chess, agriculture, and "sashimi." If we take frequency statistics of basic words that appear in definitions from a number of dictionaries, the vector component of the basic words that appear frequently is high. About 3,000 basic words have been chosen and so all words are expressed as a 3,000-dimensional vector. The same type of experiment is being implemented at Nara Sentan University. At the CSLI at Stanford University [19] [20], newspaper articles are being used as a corpus. Here, there is a strong relationship between words that appear in a window containing 40 consecutive words from an article. That is, these become the objects of association. The CSLI has thus adopted a method to reduce the amount of calculation whereby the vectors are compressed to 200-dimensional vectors. In these methods the resemblance

between the concepts of two words is determined by calculating the cosine of the two multi-dimensional vectors. The closer the result is to 1, the closer the concepts of the two words.

The NTT method can be used in the same way for the English language. The CSLI method can also be applied to articles in Japanese newspapers. A concept base built from a dictionary is akin to the knowledge and concepts of a people. A base built from a newspaper is based on current knowledge. A synthesis of both vectors will therefore be a combination of ethnic knowledge and current knowledge. The same can be done based on novels, histories, employee magazines, and electronic mail. It is interesting to think that these meaning vectors could be used in the same way as words by determining the sum of vectors not only for one word, but for all words that make up a sentence or a whole article. By feeding the system articles, we can quickly find articles with similar contents. It means one can pick up specific news he is interested in, out of unreadable amount of the Web pages. Concept bases built from this idea have not yet reached the practical stage and the probability of hits in searches for similar words is still not high. One reason for this is that the corpus provided (between hundreds of thousands of words and millions of words) is still not adequate. In the future, as this quantitative problem is overcome, trial and error will be repeated even in parallel-processing algorithms. If trials can succeed by using statistical systems derived from a corpus to numerically express the knowledge background of people, not only will information searches become easier, there will also be many extremely interesting sociological applications. For example, before sending a message, it will be possible to see what associations were made by Californian readers when they read a specific article, what associations were made by the Japanese, or the Chinese. Advertising results will be improved. There are many areas in which such tools could be utilized in the 21st century including electronic mail, electronic newspapers, and electronic libraries.

(3) Ranking Internet home pages

Ozu films, which depict post-war Japanese families, have been acclaimed by people in the film industry all over the world as classic cultural works. These films have contributed to an understanding of Japanese culture to the extent that we can now say that the essence of human relationships within a family is the same whether one is in Europe or United States or Japan. Recently, the television drama "Oshin" drew fans from all around Asia, and was highly successful in revising the image of the Japanese who are sometimes seen as arrogant and economically powerful. Novels have not reached as broad an audience. There are no newspapers that rival the CNN television news network. In short, the influence of multimedia-based information is very high.

The Internet is also a form of multimedia. For a uniform cost anyone can obtain information instantaneously. There are now no differences in terms of time and distance between information that can be obtained in different parts of the world. Furthermore, anyone can become a broadcasting station, transmitting to the world. The Internet is a revolutionary tool because, unlike television, there are no regulations regarding what material can be transmitted.

Through the Web, recipients can gather information about New York theaters, Washington agencies, London's securities district, the Roppongi entertainment district in Tokyo,

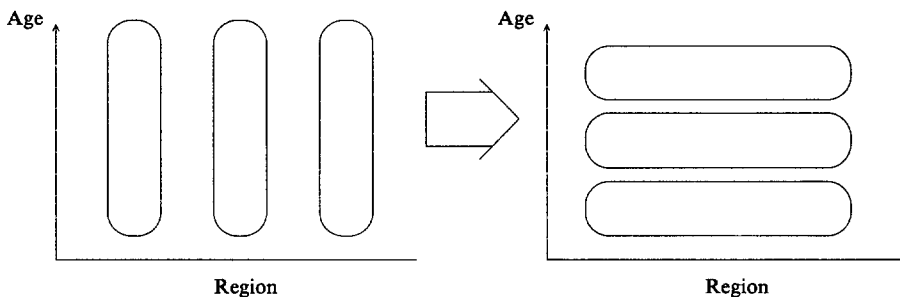
scenery at Mount Everest, and Arabian oil. It is said that “Information is food for thought.” However, just as travelers’ stomachs can be harmed through sampling food on a journey, trouble can also arise when incorrect bulletins or exaggerated advertisements on the Internet, where information is not screened, are believed. However, despite such cases, the author cannot agree with the movement to restrict the type of information that can be transmitted on the Internet. Just as it is up to the recipient of gossip on a street corner to believe or disbelieve what they have heard, so too on the Internet, it is the responsibility of recipients to judge the information they receive. Just as Michelin ranks restaurants for travelers, isn’t it enough for an independent body to rank home pages according to the quality, quantity and appropriateness of their information.

(4) Inter-generation communication

All over Asia, people are interested in the current popular songs of Japan. Young people are more interested in songs of others in the same generation from different countries than they are in participating in “karaoke” with the older generation. Japanese young people are also aware of new pop music in the United States better than many American adults. In the latter half of the 20th century, differences in regions and ethnic cultures have been raised as barriers to communication. However, the spread of communication and the broadcast media means that problems caused by regional differences will be reduced in the next century. Instead it seems that mutual understanding between generations has become more difficult than mutual understanding between people of another country.

Information technology has progressed rapidly in recent years. Just as with car model changes, changes in operating systems for personal computers, word-processing software, presentation software, Internet Navigator, communication lines, and broadcasting media seem to be increasing the information gap between generations. I come back to personal experience. One year ago, I moved from the business world to academia. If I experienced culture shock, it was in conversation with 20-year old students over drinks. Meetings with other professors were as I had imagined, as I had previously had associations with professors in academic societies. However, I could not understand what the students were talking about over drinks. They use a language system other than that used in the classroom. An e-mail bulletin is used for communications about seminars, but here too, the language between friends is something unique. The writing is not like that used when they write reports to me. In “Language and

FIG. 7 FROM REGION-DEPENDENT CULTURES TO GENERATION-DEPENDENT CULTURES



Society” [3], Trudgill says that a group reversion consciousness is expressed in the language people use. I believe conversely that a unique language system different to that used in the outside world is always required when forming a group. After one year and after having been out to drinks many times, not unwillingly, I am able to understand it but still unable to speak their group language.

Today, although English is going to become a globally common language, people will keep another special language to show the group membership. Even when his mother language is English, he will show a unique English in his special group.

The human communications are classified into two types. In one, tools and standardization can be effective in raising the degree of understanding intention. The other type rejects this work. Great results can be expected in information science aids for the former type of communication. However, as for the latter, code communication will need the supports of communication that results from actions as explained in Zen.

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