

Cultural Diversity and Value Criteria in ICT-related Behavior

- A View from the Artifact Development Analysis -

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1. Introduction

Information and Communication Technology (ICT) has evolved explosively since the late 1990's. Now we are in the midst of various ICT-related artifacts and changing our behavior patterns in proportion to that development. But if we look around our surroundings and the world as a whole, we can find different pattern of human behavior using such artifacts. The way people shape up their own life environment by adopting the artifact is not same to all of us. What people select to use for achieving their goal varies depending on their culture and the value system. What people regard something as useful and usable differs depending on the diversity of people and the culture.

In this chapter, the author first classifies different categories of culture that is not the same with the conventional definition of culture as representing specific patterns of behavior. The author does not think the concept of culture as based on the category of "nation", and showed how different types of culture we have. Then he differentiated the people into the consumer and the user based on the phase of relationship with the artifact and showed how different value criteria are related to the behavior of each type of people. From among the large number of criteria, the author focused on the usability as an important quality characteristic of artifacts and the satisfaction as an ultimate goal of the user. At the same time, the author put emphasis on considering the diversity of people, and pointed that the designer should consider such diversity as well as the constraints for manufacturing the artifact. The diversity of artifacts has been generated based on such factors as well as the cultural background.

By focusing on the diversity of artifact, the author proposed to focus on the spatial dimension and the temporal dimension in terms of the artifact development. Artifact Development

Analysis (ADA) is a new discipline based on that consideration. An empirical result on the selection of communication device is shown as to facilitate the understanding of the ADA and the data obtained in Japan and the US showed how culture of different category is affecting the behavior of people.

2. Diversity of Culture

2.1 National Culture

Range of definition of culture is quite diverse as Kroeber and Kluckhohn (1963), for example, listed 164 different definitions. It is not the goal of this chapter to re-define the concept by speculating on that various definition. In this chapter, the author simply defines it as "*the way people think, believe, behave and make and use the artifact that is shared and inherited among a specific group of people*".

It is interesting that many people including the mass media, the industry people and even the academic professionals use the term "culture" as simply meaning the "national culture" in such a way as American culture, French culture and Japanese culture. It is true that the concept of culture can easily become obvious by providing the contour, in other words, the extension of the concept. And the border between countries can be used as an easy way for setting up the contour.

The nation is a political area separated by the geographical border. And the politics limits people and commodities from going out and coming in to the nation. As a natural consequence, there emerges a unique culture compared to other countries. A national culture may be influenced by other cultures by the traffic of people and commodities and more often by the invasion and the subjugation. The latter occurs frequently when some nation is occupied by another nation and is merged into it.

Besides, it is quite easy for us to feel various kinds of difference in the character set and the language, the manner of

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people, the type of buildings, and the way of people dealing with things, etc. when we visit other countries. Because it is less frequent for us to travel abroad than to travel within the home nation, anything in foreign nations appear fresh or strange for our eyes. And when we notice any kind of difference, we focus on it and realize that the culture is different in this nation from ours.

2.2 Ethnic Culture and National Culture

Another major factor that differentiates the culture is the ethnic group. Think of Chinese people, for example, living in the Mainland China, Taiwan, Singapore, USA, Japan and other countries. They have something in common even though their political and geographical environment are different. And if we notice this kind of common characteristics, it is the basis for the concept of “ethnic culture”.

Chinese people, for example, have built China towns in many countries. Inside the China town, people usually use the Chinese language including various dialects and eat Chinese foods wherever that China town is located in the US or in Japan. But the Chinese people living in China towns are not behaving completely in the same way in the US and in Japan just because of the simple reason they are Chinese. Chinese people living in the US and in Japan, for example, are somewhat different because each of them is accepting the national culture of the US and Japan. Shopping behavior is one example. Chinese people in the US go to an American style of supermarket and accept the way of shopping in that nation, for example, the payment method, and vice versa.

Language is another important issue to consider about the relationship between the national culture and the ethnic culture. Chinese people in the US usually speak the Chinese and the English whereas those who living in Japan usually speak the Chinese and the Japanese. They are adapted to both of the ethnic culture and the national culture.

The national culture and the ethnic culture are intermixed, thus creating the combination of both types of cultures. In other words, Japanese culture is a mixture of the culture of Japanese people, Chinese people, Korean people, etc. and has a certain characteristics as a whole which is different from the American culture that is a mixture of Whites (English, Irish, Scottish, French, German, Scandinavian, etc), Blacks, Puerto Rican, Mexican, Chinese, Korean, etc. It is the same for

Chinese people and the ethnic culture of Chinese people is affected by the national culture of the nation where they live.

In the books on the user interface design, it is usually pointed out that the design of artifact should consider the local culture hence the efforts for localization is regarded as important. But the concept of culture in such books is mainly focusing on the national culture and not on the ethnic culture. It is because of the reason that the products in American market have labels and documents in most cases written in English and the products in Japanese market have labels and documents written in Japanese. But we will have to realize that there are Mexican people who can understand only the Spanish and are living in the US and there are Brazilian people who can understand only the Portuguese and are living in Japan.

2.3 Other Types of Culture

Because the culture is “*the way people think, believe, behave and make and use the artifacts that is shared and inherited among a specific group of people*”, there are other concepts of culture than the “national culture” and the “ethnic culture” wherever there is a group of people of any kind.

2.3.1 Organizational Culture

A typical example of culture is the “organizational culture” as was pointed out by Hofstede (2004). It is generally recognized that there are different ways things are done from company to company. For example, electronic companies such as NEC, SONY, Fujitsu, and Hitachi have their own practices even though they have something in common as the electronic company originated in Japan. Fundamentally they are adopting the lifetime employment system that is quite popular in Japan. Kaizen as an emphasis on the bottom up activity has also influenced their organizational culture and 4S movement that direct workers toward the arrangement (Seiri), the orderedness (Seiton), the neatness (Seiketsu) and the cleanness (Seisou) is spreading out in Japanese organizations as an organizational culture. Ever since those companies have become the worldwide company, these characteristics in their organizational culture were also exported to their branches in other nations. Of course, there was an effort to adapt those culture-based management techniques to match with the nation culture of the targeted place where the branch is located. Hence the cultural atmosphere of the branch of those Japanese companies is dominated by the mixture of the

“nation culture” of the nation and the “organizational culture” of the company.

An important aspect of the organizational culture is that it is not based on the geographical area but on the virtual area. Organizations including company, group of interest, academic association, university and so on consist of members who are not geographically living nearby. On the contrary, organizations are based on people who have the same identity with the common property as a member of the organization. And recently, the concept of organization exceeds the limit of other category of culture based on the use of the internet.

2.3.2 Generation Culture

The generation gap exists as a difference in values and attitudes between young generation and their parental generation. It is because people in each generation experienced the same social and historical events and the same ideology that are different from other generation. Some part of this “generation culture” can thus be attributed to the cohort as a group of people who was born in the same time era. A typical example is the student power movement in late 1960s. The cultural revolution in China triggered this movement and there occurred similar political movement among students in other countries such as France, the US, Italy, Germany and Japan. Although there was a difference in their slogans, this synchronized movement was a kind of revelation of the “generation culture”.

But other part of this “generation culture” is common to the same age group as a people who are living in the same psychological developmental stage. In other words, young people in 1960’s and 2010’s have something common in such a way that they feel the repulsion to the old generation. The fact that the movie “Rebel without a Cause (1955)” obtained a universal appraisal is an example to show that this type of generation culture is a universal one.

2.3.3 Gender Culture

The gender is another category of culture that characterizes the “gender culture”, i.e. the male culture and the female culture. It is quite common that the ethnic culture forces people to behave accordingly to their gender, just because they are physically male or female. The ethnic culture forces the member to wear differently, to speak differently, and to behave differently. With a small number of exceptions, there is a same tendency in many ethnic groups in the world that

requires the male to be socially active and restrict the female to be socially inactive. In other words, the male should be outside and the female inside. It is strikingly strange that the behavior of people has been restricted simply because of their physical genital difference although the physical difference such as the height or the weight was not thought to be relevant to such discrimination. But it has been evident that the gender was surely one of the categories that differentiate the culture.

After the first movement before early 20th century, there was a world-wide movement of women’s liberation in late 1960’s and the feminism in 1970’s and after. Due to such movements, women have achieved to get the equal rights in politics and in labor, etc. especially in developed countries. But it does not mean that the difference between the male culture and the female culture disappeared. There still exist different types of language for men and women as in Japanese, different types of clothes, different types of taste, etc.

2.3.4 Religious Culture

The religion puts constraints to the behavior of people including the way of thinking among people and surely is one of the categories of culture. There are nations where only a single religion is allowed in which case the nation culture is quite closely related to the “religious culture” but in most cases multiple religions are allowed for each person to believe.

For example, in Japan, the population of those who believe in Shintoism is 106,000,000, Buddhism 96,000,000, Christianity 2,000,000, and other religions 11,000,000. It is interesting to check that the sum of these figures is 215,000,000 where the total population of Japan is 127,767,994. The sum is about twice as many as the total population. This means that the life of Japanese people today is not much influenced by the religion and many of them do not put strict rules on themselves regarding the religion. In such countries as Japan, the influential power of religion over the everyday life of people is weak, but there still exists religious culture in Japan as can be seen in ceremonies such as the wedding and the funeral and in yearly events. What Japanese people are accepting can be said as a mixture of Shintoism and Buddhism. People are accepting both religions and are influenced by both of them. Important point here is that they are just accepting them and not necessarily believing in them as in the sense what the Islamic people are doing. This is one of the forms of religious culture to be harmonized with the society.

2.3.5 Regional Culture

The connotation of the concept of nation differs from nation to nation. It is a unit that was organized through the history and the power balance. In the case of Yugoslavia, it is now separated into 6 (7) countries including Bosnia and Herzegovina, Croatia, (Kosovo,) Republic of Macedonia, Montenegro, Serbia and Slovenia that have been the regions in Yugoslavia. There are many cases like this when we look back the history.

In other words, the region is a smaller unit of politics and culture than the nation and it has a chance of becoming a nation depending on the situation. In other words, we can identify the “regional culture” in each region that is similar with each other from the viewpoint of the “national culture” but, at the same time, has unique characteristics.

Even in a peaceful situation, there are many regions that have their unique culture within the same nation hence many “regional cultures” can co-exists within the nation. In Japan, there are at least three major regions that have their own unique cultures; i.e. Tokyo, Osaka and Kyoto. Such regional culture does not coincide with the administrative unit or the prefecture. For example, Tokyo is a metropolitan area as an administrative unit but the “Tokyo culture” includes some part of adjacent prefectures including Kanagawa, Saitama, and Chiba.

2.3.6 Family Culture

The family is the smallest unit of the society and because of this reason it influences the mind and the behavior of individuals so strongly. People spend much time with other family members and inside this social relationship much information come and go among members, thus influencing to build up the mental set and the behavior pattern of members. Among the social relationship in a family, the parent-child relationship is usually the strongest one compared to the relationship among children. It is the basis for handing down various cultural aspects including the national culture, the regional culture, the religious culture, etc. from generation to generation. But the family is not just a ship to carry such cultural elements. It has its own characteristic pattern of thinking and behavior, for example, the table manner, the initiative to control the TV channel, the authoritative power of the parent, etc.

2.3.7 Global Culture

We, human beings, have many characteristics in common even though there are so many differences based on the national culture, the ethnic culture and other aspects of culture. Examples are the facts that people celebrate the birthday, the wedding, and a new year’s day, people are given the name, people believe in some kind of religions, people use the money to buy things, etc. These common aspects as a human being are the “global culture”.

2.4 Onion Model of Culture

Diversity of culture described above can be summarized as Fig. 1 that shows the section layer of the culture as a cut onion. The inside-outside dimension is fundamentally a geography-based hierarchical cultural dimension where the individual is in the kernel then covered with the family culture, the regional culture, the national culture and the global culture. The ethnic culture overlaps with the national culture but is not completely the same with it. Other categories of culture, namely the organizational culture, the generation culture, the gender culture and the religious culture, are orthogonal cultural dimensions to the geography-based cultural dimensions.

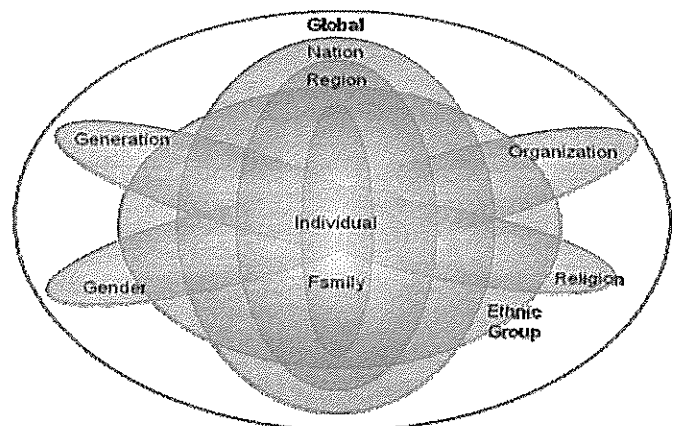


Fig. 1 The Onion Model of Culture

3. Culture, VALUE and ict-related behavior

3.1 Culture and Value

Each culture has its own value system to judge something whether it is good or bad, better or worse whatever the category of culture is. Sometimes the value systems contradict each other, for example, what the family culture

judge to be good cannot be accepted by the nation culture or vice versa. The value system will have certain number of mutually independent dimensions.

The typical dimensions of value were proposed by German philosopher Spranger (1921). He postulated 6 different value types including “theoretical” that put emphasis on the discovery of truth, “economic” on what is useful, “aesthetic” on the form and the harmony, “religious” on the unity, “social” on the love of people and “political” on the power.

Spranger’s value type does not simply correspond to the category of culture and the relationship between the culture and the value is not straightforward but some category of culture will put emphasis on the specific values. For example, some nation culture will emphasize the importance of the economic value and the political value. The religious culture will, of course, put emphasis on the religious value. The organizational culture will put emphasis on the social value and the economic value especially in the case of the company culture.

But what is more important is that the individuals who are influenced more or less by all categories of culture will have their own unique profiles in terms of the value type. The degree of influence of each cultural category may be different

from individual to individual. And what makes the relationship more difficult to identify is that the influence of culture is, in most cases, covert one and is unconsciously influencing the mental set of the individual. For each individual, his/her mental set or the attitude is regarded as natural to oneself and the individual will not be aware of what kind of culture is influencing to what extent to his/her mental set or attitude.

When there is a contradiction between the design of some artifact and the value system, the existence of the category of culture of any kind will be consciously recognized. For example, if an American designer is going to make the web page design of some product for Japanese customers and he adopted the Japanese flag as the basic design of the page, many Japanese people will think something inadequate by looking at the web page. It is because of the memory of the World War II where the flag was used as a symbol of the Japanese regime at that time and many Japanese do not have a positive feeling to the flag now. In this case, the current national culture of Japan is influencing Japanese people toward neglecting the use of the flag. And Japanese people will realize the existence of the national culture inside themselves of which they might have been unaware of it until such an occurrence.

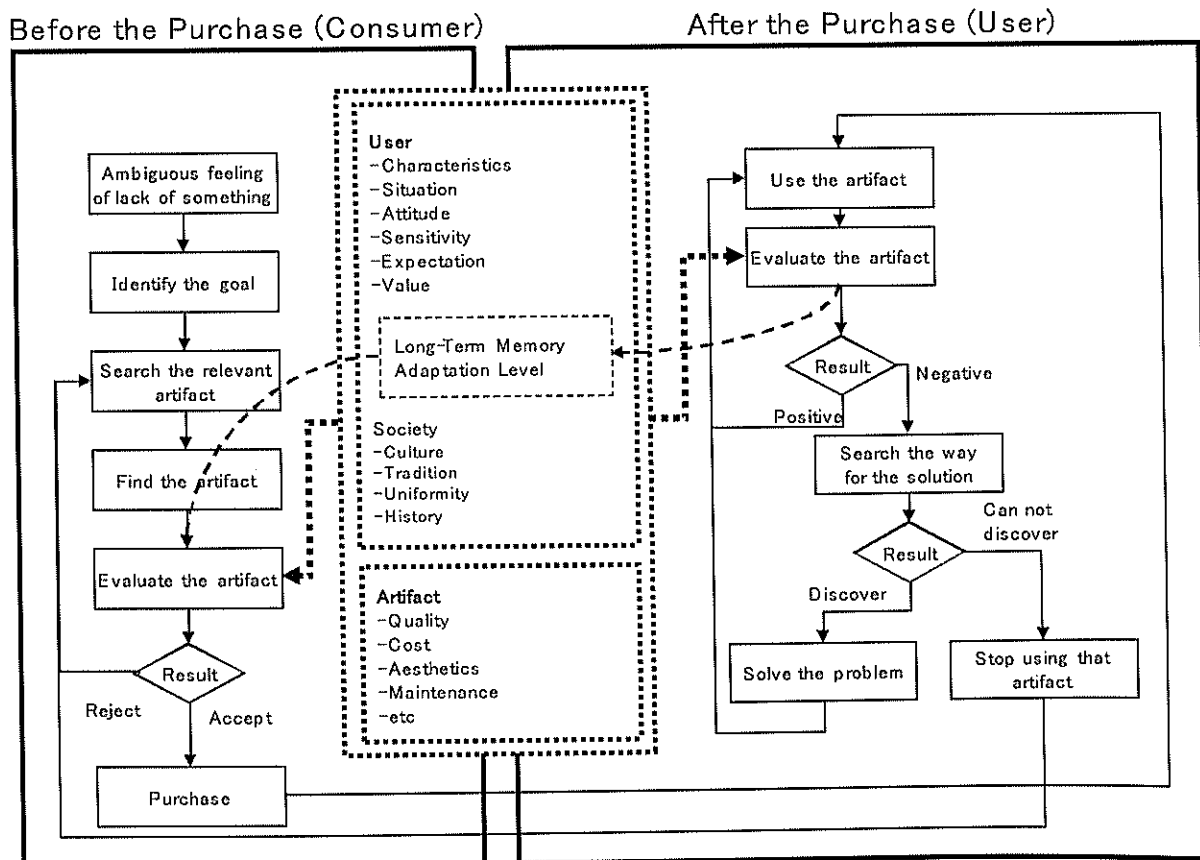


Fig. 2 The relationship of people to the artifact that changes before and after the purchase

3.2 Consumer and User

The relationship between the people and the artifact changes before and after the purchase. Before purchasing something they are the consumer and after the purchase they become the user. This process is described in Fig. 2. At first, consumers are feeling the lack of something. Then they realize what is missing and identify their own goal and start searching for the artifact that will help them to achieve the goal. When they find out some artifact, they evaluate it with their own criteria including the value system of their own and the culture of the society to which they belong. If the result was acceptable, they start to use it and they change their stance from the consumer to the user. While using the artifact, they evaluate the artifact if it is really helping them to achieve the goal effectively and efficiently. If the evaluation result was negative, users try to find out the way to fix the problem. And if they cannot find out the way to fix it, they stop using it and go back to the status as the consumer and start again to search for the artifact that will help them to achieve the goal.

In Fig. 2, there are two boxes of evaluation; one in the consumer side and another in the user side. This means that people are constantly evaluating the artifact if it is adequate or not for achieving the goal. Criteria for the evaluation are shown in the middle box. But they are different when they are the consumer and the user as can be seen in Tab. 1. For the sake of simplicity, Tab. 1 put each criterion on either side of the consumer and the user. But some criteria will actually be used in both situations. The purpose of Tab. 1 is to show how

different criteria can be used when people are the consumer and when they are the user. Although Tab. 1 is not yet an exhaustive list of all possible criteria, the reader may understand the meaning of the table.

Some of the criteria in Tab. 1 are quite culturally influenced. For example, the criterion “Being the same with the one that the friend owns” is one of the typical behavior patterns of Japanese. So this can be regarded as related to the “ethnic culture” of Japanese people. The criteria “Having many functions” and “Having novel functions” are the attitude that can frequently be found among young people. And this could be related to the “generation culture” of young people. One more example is the criterion “Being compatible with other products” is quite important for the manager of an organization who is in a position to decide which device to install to their office environment, hence this criterion is related to the “organizational culture”.

Tab. 1 List of criteria for consumers and users

Consumer	Reputation	Having high reputation in the mass media (journal, web, etc.)
	Brand	Being a product of favorite brand Being a product of famous brand
	Cost	Setting a low retail price
	Design	Being good-looking
		Being novel and unconventional
		Being less prominent
	Familiarity	Being the same with the one that the friend owns
	Functionality	Having many functions
		Having novel functions
		Having attractive functions
	Novelty	Being with no similar product ever
		Being a novel product in the market
		Not being the used one
Obtainability	Being easy to obtain or purchase	
Performance	Having high processing speed	
	Having high level of capacity	
	Spending minimal amount of electricity	
Reputation	Having high reputation in the local community (family members, friends, neighbors,	
	Having high reputation by professionals (salesperson, dealer, etc.)	
Self Expression	Being able to express oneself by possessing it	
	Being able to differentiate from other people	
User	Abolition	Requiring less time to waste
	Compatibility	Being compatible with other products
	Cost	Requiring a low cost while using it
	Design	Giving the feeling of attachment
	Durability	Being able to use for a long time
	Infrastructure	Being provided a social infrastructure
		Being easy to repair
	Maintenability	Being easy to ask repair
		Matching to the environment
		Giving no negative influence while using it Giving no negative influence when abolish it
	Matching to Environment	Being not too heavy
		Being not too light weighted
		Being not too large
		Being not too small
	Physical Traits	Emitting no extra light and sound
		Having less chance of trouble
		Having less chance of declining the performance
	Reliability	Facilitating correct behavior for the operation
		Safety
Usability	Being easy to install	
	Being effective	
	Being efficient	
	Being easy to understand	

3.3 ICT-related Behavior and Usability

Information and Communication Technology (ICT) has developed in these 20-30 years very rapidly. The trigger of this phenomenon was the advent of the PC and the embedded micro-computer chips. It was an era of Information Technology (IT). In 1980's and 1990's, it was found that these devices and systems were difficult to use, especially for those who don't have the necessary level of literacy to control them. The market of the computer-related devices and systems expanded rapidly because of the useful functionality and high level of performance, but the complaints of the user also increased in proportion to the amount of devices and systems in their working environment.

Furthermore, in 1990's and 2000's, the internet changed the total aspect of our life and the web interface became of greater importance. This is the coming of the era of Communication Technology (CT). Because the internet communication needed the support of the IT, the IT and the CT were combined as the ICT. Then the ICT became an important focus of attention for working and living environment in the world today.

This was the reason for ISO standards to appear so that the criteria described in such standards will control the quality in use or the usability as an important aspect of value system. ISO9241-11 appeared in 1998 and proposed the definition of usability. According to ISO9241-11, the usability is "the extent to which a product can be used by specified users to achieve specified goal with effectiveness, efficiency and satisfaction in a specified context of use" where the effectiveness is defined as "the accuracy and completeness with which users achieve specified goals", the efficiency as "the resources expended in relation to the accuracy and completeness with which users achieve goals" and the satisfaction as "the freedom from discomfort, and positive attitudes to the use of the product".

ISO13407 that is now going to be revised as ISO9241-210 is an important ISO standard in terms of the usability. This standard adopts the definition of the concept of usability of ISO9241-11 and describes how the design process can achieve the usability. The most important point of this standard is that it does not refer to the level of usability of each device or system. Instead, this standard proposed a process model in terms of the human centered design (HCD). The basic idea of the process model is similar to the PDS (Plan Do See) cycle

or PDCA (Plan Do Check Act) cycle or PDSA (Plan Do Study Act) cycle of Shewhart and Deming.

Though the concept definition of usability of ISO9241-11 is now accepted as a standard definition of the usability almost all over the world, the author (2009) is proposing somewhat different definition of usability as described in Fig. 3. In ISO9241-11, the usability is defined as having three sub-concepts; effectiveness, efficiency and satisfaction. It is acceptable that the concepts of effectiveness and efficiency are mutually exclusive and are independent with each other. But the satisfaction depends on the effectiveness and the efficiency because if some artifact is effective or efficient the user may feel the satisfaction. This dependency among sub-concepts is one reason for the satisfaction to be excluded from the usability as described in Fig. 3. Another point is that the satisfaction is a subjective impression of the user whereas the effectiveness and the efficiency are physical characteristics of the artifact of which the objective measurement can be done. Furthermore, the satisfaction will be influenced by other quality traits such as the reliability or the safety, and will also be influenced by other subjective traits as the emotion, the motivation and the value system. These are the reasons why the author put satisfaction out of the range of usability and locate it at the position one level higher than other sub-concepts. In other words, the supreme goal of the artifact design is the satisfaction in the concept structure described in Fig. 3.

It is also important here that the satisfaction is affected by the culture and the value, more from the user's viewpoint than from the consumer's viewpoint. In other words, the designer should understand the user and the context of use of which the culture and the value are playing an important role. As the process model of ISO13407 states, the designer has to investigate the user and the context of use, thus understand the cultural influence and the specific value on which the user put more emphasis. The first step for understanding the user should be to clarify which nation, ethnic group, generation, gender, organization, and religious group, the user belongs. And the second step should be to specify on which value criterion the user put the emphasis in each category of the culture.

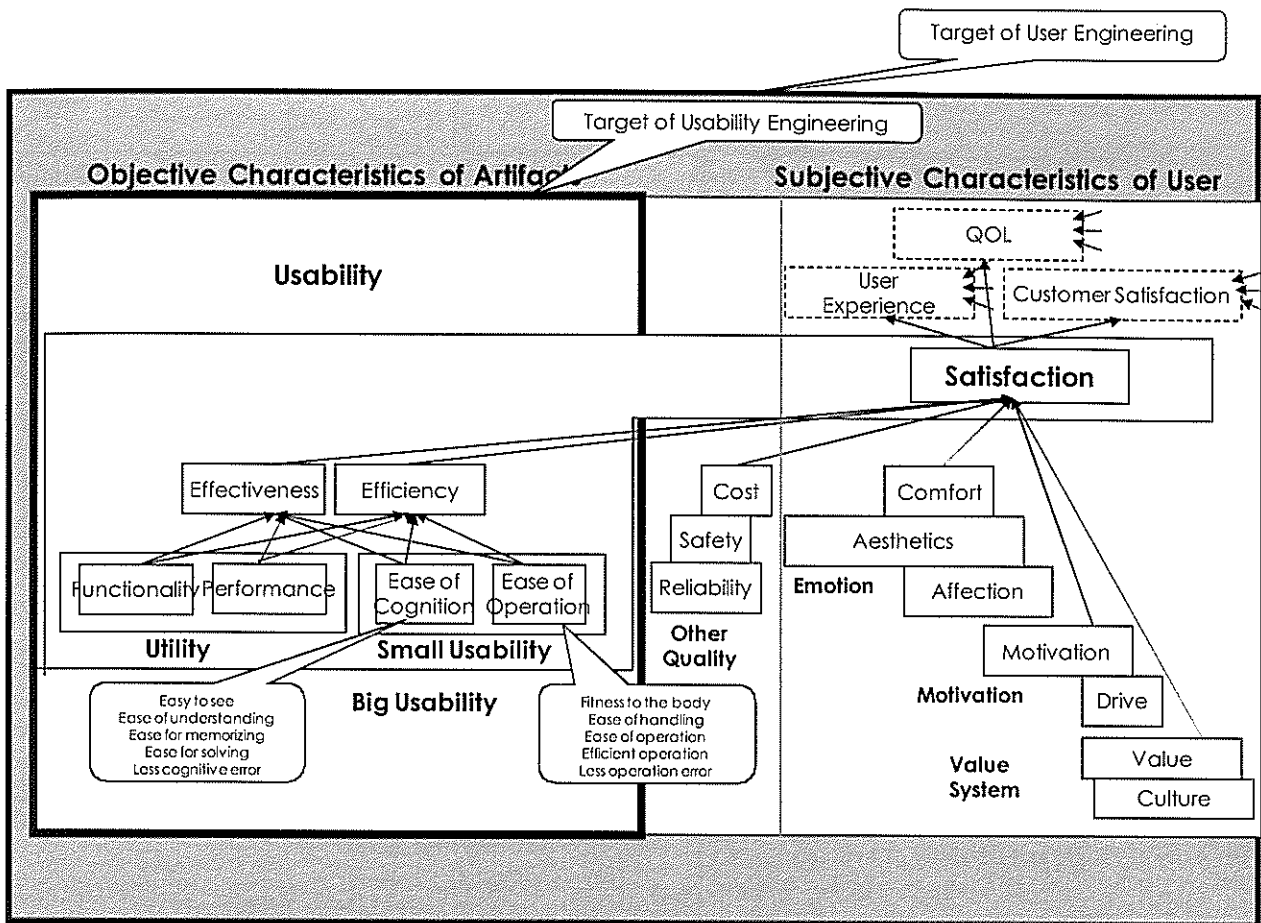


Fig. 3 Concept of Usability and Satisfaction proposed by Kurosu

4. A Perspective from the artifact Development analysis

4.1 Goal Achievement and the Usability of Artifact

Fundamentally, the human behavior is goal-oriented with just an exception of unconscious behavior, e.g. body motion while sleeping. As is described in Fig. 4, the user is in the current status where they have some goal to achieve but not yet in the goal status. Goals include obtaining something, eating or drinking something, recording some information,

communicating with somebody, knowing the current location, keeping the body warm, etc. There is a certain gap that should be overcome between the current status and the goal. When users try to reach the goal, the path toward the goal is not simple. Sometimes, they may fail to get there, or sometimes they may reach there but with a long winding path. The best way to reach the goal is a straightforward one. Because it is not easy to get there in straight, users need the support of an artifact. And if the artifact is effective and efficient, i.e. with a high level of usability, it becomes quite easy to get to the goal.

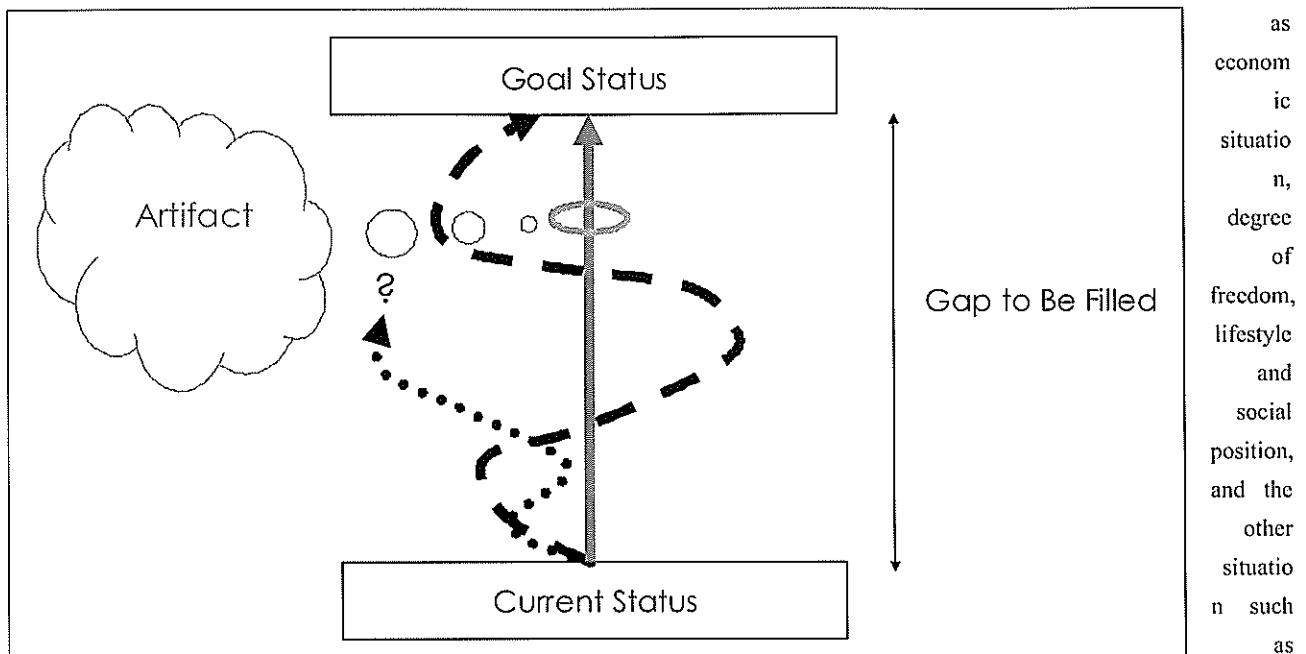


Fig. 4 Goal achievement and the artifact

4.2 Diversity of People and Diversity of Artifacts

4.2.1 Diversity of People

As the universal design approach points out, there are various types of users including disabled and senior people as well as the “normal” people. But there are more dimensions in the diversity of people. In order for the artifact to be usable by supporting users to achieve the goal, the design of artifact should consider about such a variety among people.

Tab. 2 shows the list of various dimensions in terms of the diversity of people. The table differentiates traits, situation and attitude. The traits are characteristics of people as a “point” in the multi-dimensional space of characteristics and the situation is a “surroundings” of that point. The Attitude is a “tendency” to move from that point. In other words, traits are the static characteristics and the attitude is the dynamic characteristics.

The traits include the biological traits such as age, generation, sex & gender, physical traits, cognitive traits and body dimension. They also include the psychological traits such as mental traits, knowledge and skill, cognitive style and learning style, and the social traits such as language, culture, historical background and educational background. The situation include the mental situation such as emotional condition and level of consciousness, the social situation such

urgency, geographical situation, physical condition and temporary condition. And the attitude includes individual preference, political attitude, religion, regression to tradition, and social attitude.

Not all of these traits, situation and attitude have something to do with the design of a specific artifact. For example, the design of the life jacket is strongly related to the urgency but not so much to the religion. On the other hand, the design of the mourning dress is related to religion, regression to tradition, social position, age, sex, body dimension, culture and historical background but not to cognitive traits and learning style.

4.2.2 Diversity of Artifacts

The diversity of people will thus bring different designs depending on the factors listed in Tab. 2. But the diversity of artifacts is also affected by such a factor as the manufacturing, i.e. availability of the material, availability of the manufacturing tool or device, characteristics of the raw material, manufacturing cost, emphasis on the maintenance, reliability and the safety, and aesthetic sense of the designer.

The design of artifacts thus varies differently. And in this diversity, the culture plays an important role. Tools for eating, for example, take very different forms depending on the ethnic culture. The goal of those tools is quite simple, i.e. just to deliver the food to the mouth. But there are different types of knives, forks and spoons depending on the physical characteristics of the food material. On the other hands, the chopsticks are popularly used in Eastern Asia. But the

Tab. 2 Diversity of People

<u>Traits</u>	<u>Situation</u>	<u>Attitude</u>
Biological Traits	Mental Situation	Individual Preference (Many Preferences, No Preferences, etc)
Age, Generation (Senior, Middle-aged, Young, Children, Baby)	Emotional Condition (Stable, Unstable, Urgent, etc)	Political Attitude (Left-winged, Right-winged, Neutral)
Sex, Gender (Male, Female, Gender Identity Disorder)	Level of Consciousness (Sleep, Indistinct, Aroused, Over-excited)	Religion (No Religion, Buddhism, Islam, Christianity, Newly-risen Religion, etc)
Physical Traits (Upper Limb Disorder, Lower Limb Disorder, Paralysis, Pregnancy, Hurt, Handedness, etc)		Regression to Tradition (Conservative, Innovative, Radical, etc)
Cognitive Traits (Visual Disorder: Poor-sightedness, Inborn Blindness, Acquired Blindness, Color-Blindness, etc.) (Hearing Impaired) (Cognitive Impaired)	Social Situation	Social Attitude (Individualism, Collectivism, Anti-socialism, etc)
Body Dimension (Height, Weight, Hand Size, Arm Length, Leg Length, Flexibility, Hand Power, Fine Operation, etc)	Economic Situation (Income Level, Regularity of Income, etc)	
Psychological Traits	Freedom (Free Situation, Staying in the Office or School, In Custody, etc)	
Mental Traits (Psychosis, Neurosis, Personality Disorder, Mental Retardation, etc)	Lifestyle (Workaholic, LOHAS, DINKS etc)	
Knowledge and Skill (Novice, Expert)	Social Position (Salaried Employee, Self-Employed,)	
Cognitive Style (Systematic Cognition, Unsystematic Cognition, etc)	Other Situation	
Learning Style (Strategic Learning, Ad-hoc Learning, etc)	Urgency (Normal Situation, Urgent Situation)	
Social Traits	Geographical Situation (Big City, Small City, Isolated Place, etc)	
Language (Japanese, English, Chinese (Mandarin, Cantonese, etc), etc)	Physical Condition (Temperature, Humidity, Illumination, Noise Level, etc)	
Culture (Ethnic Culture, Nation Culture, Local Culture, Family Culture, Generation Culture, etc)	Temporary Condition (Heavy Baggage, Bulky Clothing, etc)	
Historical Background (Ruling Class, Ruled Class, Oppressed Class, etc)		
Educational Background (Junior High, High School, College, Graduate School, etc)		

soup and the rice in China, and a metal spoon is used for the soup in Korea. But there is no such tool in Japan, because

Japanese people bring the bowl of soup directly to the mouth.

Even though the goal is the same, the artifact used for achieving the goal differs in its design very frequently. In other words, even though the shape and the material of food is the same, the eating tool differs by the ethnic culture. For example, in Western Europe, the fork is used to eat the noodle "spaghetti", but in East Asia, the chopsticks are used to eat the noodle "udon", "ramen" or "chow mein".

The important question is which tool is the most suitable and gives the user a satisfaction. There is a possibility that people are keeping use of the artifact that is not best fitted for achieving the goal because of the simple reason they don't know other type of artifact. Chances are, other type of artifact

material and the shape of chopsticks differs from ethnic group to ethnic group. In Japan, the chopsticks are made of wood or bamboo and have a pointed shape. In China, they are usually round and not pointed at the tip. In Korea, the material is the metal and the shape is flat rather than round. In addition to the chopsticks, a ceramic spoon is used for the

can achieve the same goal more effectively and more efficiently in a different way. People may not know it and are just inheriting the artifact in that specific culture. As an example of overcoming such a simple inheritance is that there emerged a new type of Italian restaurants in Japan that serves the spaghetti with chopsticks because the spaghetti is one of

the noodles. It is one of the trials to provide a more goal-adapted artifact that will bring higher level of usability and satisfaction by overcoming the barrier of culture.

The diversity of artifacts does not emerge not only for the ethnic culture. Let us consider an example for the gender culture. In many ethnic groups, it is usual for male and female to have different clothes. A simple example is the pants for male and the skirt for female. Although the style and the material are different from the ethnic group to the ethnic group, the fact that the clothes are different for male and female is universal. So this is an example of artifact diversity in terms of the gender culture.

Fig. 5 shows how variations among artifacts emerge with regard to the spatial dimension and the temporal dimension. The former corresponds to the category of culture, hence not only the nation culture or the ethnic culture but also other categories of culture such as the generation culture and the gender culture in Fig. 1 will generate different types of artifacts. In many cases, this spatial dimension is based on the real geographical space, but sometimes it will be based on the virtual space such as the group of people who believe in the same religion but are living in different areas on the globe.

The change of artifact design on the temporal dimension corresponds to the historical change. A typical example can be seen in the development of the washing machine. The goal of washing is to get rid of the dirt from the clothes. In

old times (and in some areas still today), people were washing clothes by hand or with just a simple tool as a washing rod or a washboard. In the middle of 19th century, a manually-driven washing machine appeared in the US. Then invented was an engine-driven washing machine. The first type of electric washing machine came into the market in early twentieth century. By the advent of the washing machine, people were freed from the physical pain and got the spare time. Electric washing machines became popular after the WWII. Engineers at that time considered the goal of washing more in detail and found it can be divided into such sub-goals as washing, dehydrating, and drying. At that time, washing has already been electrified, but dehydrating and drying has not yet been electrified. These sub-goals had to be processed by hand and it took the user certain amount of time and brought the physical fatigue. Hence the dehydrator was invented and the double tub washing machine appeared in the market on which one tub is for washing and another tub for dehydration. Although double tub washing machine freed users from the task of dehydration, people had to wait for the end of washing and then move clothes from the washing tub to the dehydrating tub. Thus the engineer invented the automatic washing machine by which washing and dehydrating will be done continuously in one tub in mid 1960's. Now the rest was drying. The electric dryer was invented as a separate machine and the combination of the automatic washing machine and the electric dryer became popular. But quite recently, a new type of washing machine appeared by which all of the sub-goals of washing will be

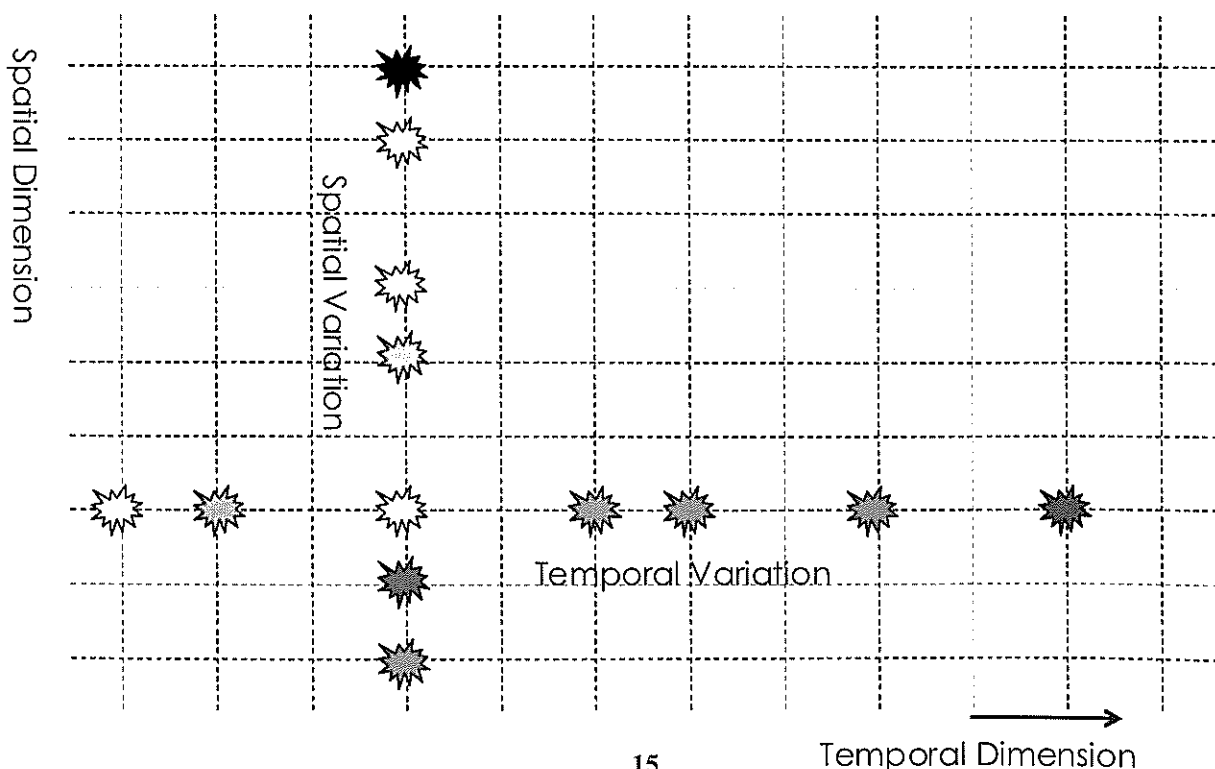


Fig. 5 Spatial and temporal variation of the artifact

done continuously in just one tub. This history of washing machine is an example of the development of artifact regarding the temporal dimension.

4.2.3 Artifact Development Analysis

The Artifact Development Analysis (ADA) is an integrative approach containing the temporal viewpoint and the spatial viewpoint to analyze the optimality of design of an artifact (Kurosu 2007-a,b,c,d). Initially it was proposed to analyze to what extent the usability is important as a value criterion for the user. But later, it was revealed that the usability is just one of the criteria to contribute to the satisfaction of the user.

The artifact is so designed that it will help the user to achieve the goal. But the design of artifact varies differently because of many reasons as was shown in Tab. 1. In other words, different people in different culture think the “best” design of artifact in a different way. The ultimate goal of artifact design is to give the user a satisfaction as in Fig. 3 and the usability is just one of the factors that contribute to the satisfaction. What the ADA approach aims is to reconsider the optimality of the design of artifacts in comparison with other types of design in spatial and temporal dimensions. If we reconsider the relationship between the initial goal and the artifact design from a fundamental viewpoint, a better solution may be found in other designs or may be created anew. In this sense, the culture of any category sometimes works as a kind of bias for the optimal design. Hence we should take a close examination on the culture in which we are unconsciously spending our life.

4.3 ADA Approach in ICT-related Behavior

In this section, an example of ADA approach will be shown with regard to the ICT-related behavior. It is concerned with the relationship between the goal achievement and the diversity of artifacts.

The focus of the research was the communication behavior. Historically, for the purpose of communication, various media have been developed and now we have many alternatives for achieving the goal of communicating to somebody else. The artifacts for communication that we have today include (1) letter, (2) postcard, (3) telegram, (4) PC mail (internet mail), (5) PC chat, (6) cell phone mail, (7) cell phone texting

(SMS), (8) cell phone call, (9) landline, (10) fax, (11) ask somebody to convey the message, (12) leave a memo, and (13) directly speak to others. We (the author and Ayako Hashizume) conducted a research by adopting the contextual inquiry (Beyer and Holtzblatt 1998) and analyzed the data by applying the GTA (Grounded Theory Approach) (Strauss and Corbin 1998).

The research was conducted in Japan and in the US for senior people over 60 yrs old and for those who are of their 20’s. Number of informants is listed in Tab. 3. Because the method used was the qualitative method (the contextual inquiry), a limited number of informants were used. The method adopted was individual-based and took about 2 hours long. Ishigaki is a rural city in Japan and Minneapolis is a big town. So there might be an influence of both types of culture including the country culture and the region culture. Honestly speaking, in order to segregate the influence of both types of culture, we need more research in urban area in Japan and rural area in the US. The results also contained the influence of the gender culture and the generation culture.

Tab. 3 List of Informants

	20’s		60’s		70’s	
	male	female	male	female	male	female
Japan	4	4	2	2	2	2
US	1	1	1	1	1	1

Japan: Ishigaki, US: Minneapolis

First, we set up 6 different situation setups as follows.

1. When you want to tell your family member that you’ll be late going back home.
2. When you want to discuss about the date and venue of the meeting.
3. When you want to talk to someone or hear his/her voice.
4. When you want to talk to someone about the change of meeting schedule.
5. When it seems that you’ll be late for the meeting.
6. When you want to express your gratitude for a gift.

During the contextual inquiry session, we showed an informant a table of communication media and asked which media s/he will use in each situation and why. Typical results are shown below.

For question 1

- In Japan, 7 out of 8 senior people (of their 60’s and 70’s) selected the cell phone call because of its speed, ease of operation and politeness. 2 out of 8 seniors selected the

land line call (because the duplicate answer was allowed). Young people (of their 20's) are half and half for selecting the cell phone call (5 out of 8) and the cell phone mail (4 out of 8). The reason for selecting the cell phone call was its ease of operation and the reason for selecting the cell phone mail was its speed.

- In the US, both generations selected the cell phone call (6 out of 6) because of its speed, ease of operation and certainty.
- Considering the uncertainty that will occur when the receiver may not notice the arrival of the mail, this answer of American informants is quite reasonable. But considering the situation where the receiver was far away from the telephone, using the cell phone mail will be more sure because the message was already sent to the receiver regardless of the situation of the receiver.

For question 2

- The result was quite contrasting. In Japan, senior people selected the cell phone call (6 out of 8) and the landline (5 out of 8) because of its certainty where young people selected the cell phone mail (6 out of 8) and the cell phone call (4 out of 8) mainly because of ease of operation.
- In the US, both informants selected the PC mail (5 out of 6) because of its ease of operation, speed and certainty. There were just a few people who selected the cell phone call and the landline but the number is 1-2 out of 6.
- Considering the possession of PC, it might be easier for American informants for using the PC than to use the cell phone. It could be attributed to the difference in the nation culture, but there is more possibility that it is related to the region culture, because Ishigaki is a rural area in Japan and more ICT devices can be possessed even by senior people in urban area such as Tokyo, Yokohama, etc.

For question 3

- The pattern of answer is quite clear that the senior people both in Japan and the US selected either of the cell phone call and the landline whereas the young people in both countries selected only the cell phone call.
- The result is reflecting the generation culture where young people are more familiar to the use of the cell phone.

For question 4

- The result reflected the nation culture or the region culture in that American informants both senior and

young selected the PC mail (4 out of 6) whereas Japanese informants whichever they are young or senior selected the cell phone call (7 out of 8 for senior and 7 out of 8 for young). Besides, the senior people in Japan answered to use the landline (6 out of 8).

- The answer to this question reflects the nation culture (or the region culture) and the generation culture in Japan. It is interesting that there is no generation difference in the US. And it is also interesting that the gender culture have not been seen influential to the questions including this one.

For question 5

- The answer was the selection of the cell phone call and was quite the same for Japanese (14 out of 16) and American (6 out of 6) informants as well as for young (9 out of 10) and senior (13 out of 14) informants.
- The only exception was the use of cell phone mail for Japanese young informants (3 out of 8).

For question 6

- Interesting results were found to this question. The choice of the letter was frequent for Japanese senior (3 out of 8), Japanese young (3 out of 8) and American senior (3 out of 4) and American young (2 out of 2) because of the politeness. This was the only situation among 6 questions that the letter was selected as a communication media.
- And it was also interesting that both of Japanese senior (6 out of 8) and Japanese young (7 out of 8) selected the cell phone call where only 1 American senior informant selected it. Furthermore Japanese senior informants (5 out of 8) selected the landline where no Japanese young and American informants selected it.
- Answers to this question reflect the nation culture and the generation culture in Japan.

Based on above results, the artifact selected differs from situation to situation and it was revealed that there was the influence of the nation culture, the region culture, and the generation culture but the gender culture was not influential in the selection of the artifact for communication. Another finding was that the category of culture related to the selection differs depending on the type of situation.

Although this research is rather a primary one and further in-depth research is necessary, the result clearly showed that the artifact selection is closely related to the category of culture. Different patterns found in this result may be related

to the future pattern of the communication behavior and will serve to the possible future development of the artifact for communication.

5. Conclusion

In this chapter, the culture was regarded as belonging to different categories other than just a nation or an ethnic group. The focus of this chapter was to clarify how the culture and the value system are influencing the design of artifacts and the selection of the artifact.

In the latter half of this chapter, the consideration about such relationship was led to the Artifact Development Analysis (ADA) and one empirical result was introduced for facilitating the understanding of this new approach. In the result of the research, it was found that various categories of culture are affecting the user's behavior as was expected.

Although the ADA is still in its cradle phase, its applicability can be thought of as wide and can give suggestions for the development of future products and systems. It is the hope of the author that many researchers in many disciplines and many stakeholders of various kinds of artifacts will be interested in the ADA approach and help it to be grown up as an established discipline.

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