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Micro Scenario Database

- An Approach to Make the Collaboration between the Human Science and the Engineering More Substantial

Masaaki Kurosu

The Open University of Japan (Japan)

The Graduate University for Advanced Studies (Japan)

1. Introduction

More and more ICT (Information and Communication Technology) related products, systems and services have appeared in the market. But it is frequently pointed out that many of them are difficult to use, not so much effective or not so much efficient – in other words, lack the usability. Some of them were intended to provide users a new functionality but failed in giving them a satisfaction by the use of them. It is because the designer and engineers of such artifacts (products, systems and services) did not understand the real need of the user and the real information about the context of use. It is frequently observed that the designers propose new artefacts just based on their own experience and on their own intuition. It is quite natural that such artefacts thus designed will not have the validity that matches to the reality.

This situation let the author consider about the desirable way for giving the designer and engineers of such artefacts the adequate information about the user. The idea of the micro scenario database described in this chapter thus came up to the mind of the author who has been involved in the development of the micro scenario method.

This chapter will give the reader an idea on what the micro scenario method is and how the micro scenario database will be effective and efficient for providing designers and other stakeholders about the user characteristics and the context of use information.

2. Who is the Real User?

2.1 Typical User Image

There is an anecdote that the typical user image that designers and engineers have in their mind is “a male of his 30’s who has a certain level of ICT knowledge”. The reason why products are difficult to use for “female” or “senior people” or “those who have not such level of knowledge” is that they are out of the range of the user’s image that designers and

engineers are assuming. But the image they have is the image of their own. In other words, designers and engineers are mostly men and the age range is from 20's to 40's with the biggest population in 30's. Besides, because they are designers and engineers, they have the knowledge and skill for using ICT-related artifacts.

If the artifacts are designed based on the user's image as described above, it is quite natural that they are difficult to use for people who have different characteristics from them. This kind of gap will occur when designers and engineers do not seek for or do not use the information about the real users.

2.2 Diversity of Users

There is a variety of characteristics among real users as shown in Table 1. This table differentiates the traits, the situation and the 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 as economic situation, degree of freedom, lifestyle and social position, and the other situation such as urgency, geographical situation, physical condition and temporary condition. And the attitude includes individual preference, political attitude, religion, regression to tradition, and social attitude.

Considering the existence of such a big differences among people as shown in this table, it is evident that we should consider the diversity of people when designing the artifact. Something that is favored to some person may be disliked by other person, and something that is usable to somebody may not be usable to others.

We have a tendency to consider about other people based on the information of ourselves. But the imagination has a limitation and we need some information obtained from the real world. That is the point where the field work techniques including the observation and the interview are expected to play an important role for the design of artifacts.

But before going to the discussion of such empirical approach, the author would like to focus on the persona and the scenario methods that have become popular recently for making the design of artifact more empirically valid.

2.3 Persona and Scenario

Persona is an arbitrary description of the user and helps engineers and designers to design the artifact more realistically. Scenario is a description of the situation and the use of some artifact and helps engineers in which way their development should be directed. Scenario-based design is a design framework proposed by Carroll to describe the situation so that the program for solving those problems should be directed properly. Both methods have now become popular and are widely used in the planning process.

Traits	Situation	Attitude
<p><u>Biological Traits</u></p> <ul style="list-style-type: none">- Age, Generation (Senior, Middle-aged, Young, Children, Baby)- Sex, Gender (Male, Female, Gender Identity Disorder)- Physical Traits (Upper Limb Disorder, Lower Limb Disorder, Paralysis, Pregnancy, Hurt, Handedness, etc) <p><u>Cognitive Traits</u></p> <ul style="list-style-type: none">- Visual - Disorder: Poor-sightedness, Inborn Blindness, Acquired Blindness, Color-Blindness, etc.- Hearing Impaired- Cognitive Impaired <p><u>Body Dimension</u></p> <ul style="list-style-type: none">- Height, Weight, Hand Size, Arm Length, Leg Length, Flexibility, Hand Power, Fine Operation, etc <p><u>Psychological Traits</u></p> <ul style="list-style-type: none">- Mental Traits (Psychosis, Neurosis, Personality Disorder, Mental Retardation, etc)- Knowledge and Skill (Novice, Expert)- Cognitive Style (Systematic Cognition, Unsystematic Cognition, etc)- Learning Style (Strategic Learning, Ad-hoc Learning, etc) <p><u>Social Traits</u></p> <ul style="list-style-type: none">- Language (Japanese, English, Chinese (Mandarine, Cantonese, etc), etc)- Culture (Ethnic Culture, Nation Culture, Local Culture, Family Culture, Generation Culture, etc)- Historical Background (Ruling Class, Ruled Class, Oppressed Class, etc)- Educational Background (Junior High, High School, College, Graduate School, etc)	<p><u>Mental Situation</u></p> <ul style="list-style-type: none">- Emotional Condition (Stable, Unstable, Urgent, etc)- Level of Consciousness (Sleep, Indistinct, Aroused, Over-excited) <p><u>Social Situation</u></p> <ul style="list-style-type: none">- Economic Situation (Income Level, Regularity of Income, etc)- Freedom (Free Situation, Staying in the Office or School, In Custody, etc)- Lifestyle (Workaholic, LOHAS, DINKS etc)- Social Position (Salaried Employee, Self-Employed,) <p><u>Other Situations</u></p> <ul style="list-style-type: none">- Urgency (Normal Situation, Urgent Situation)- Geographical Situation (Living in a Big City, in a Small City, or in an Isolated Place, etc)- Physical Condition (Temperature, Humidity, Illumination, Noise Level, etc)- Temporary Condition (Carrying a Heavy Baggage, Wearing a Bulky Clothing, etc)	<ul style="list-style-type: none">- Individual Preference (Many Preferences, No Preferences, etc)- Political Attitude (Left-winged, Right-winged, Neutral)- Religion (No Religion, Buddhism, Islam, Christianity, Newly-risen Religion, etc)- Regression to Tradition (Conservative, Innovative, Radical, etc)- Social Attitude (Individualism, Collectivism, Anti-socialism, etc)

Table 1. The Diversity among People

An example persona is shown in Figure 1. As can be seen, the persona contains descriptions on name, gender, age, occupation, personality characteristics, birth place, current address, academic background, family members, hobbies, licenses and other general information with a photograph. Although it is an artificial profile of a person, it will give engineers and designers who read that profile, a realistic image of the user. Besides, the persona contains such descriptions as the history of use for the PC, the internet and the cell phone depending on the focus of development. Furthermore it contains the background information that is related to the focus. It is a general scenario describing how the persona will act in terms of the device or the system that are the focus of development.

Name Shoichi Nomura

Gender Male

Age 63

Occupation Farmer

Personality Serious. Accomplish anything he started. Highly cooperative and has many friends. Willingly take the role of leader for the local festival.

Birth Place Furukawa city, Miyagi Prefecture

Current Address Furukawa city, Miyagi Prefecture

Academic Background Furukawa Agricultural High School

Family Mother (85 yrs.), Wife (62 yrs.), Eldest son (38 yrs.), Wife of eldest son (35 yrs.), Second son (33 yrs. In Tokyo), Grandchild (7yrs. Daughter of the eldest son)

Hobby Comic story

License Driver’s license for special big cars, Driver’s license for regular cars, License for agricultural machinery, License for poisonous substance

History of Use for PC 1 year

History of Use for Internet 1 year

History of Use for Cell phone 2 years、 Still using the first cell phone he purchased.

Background He started to help his family farmhouse business after graduating the Agricultural High School. Because he had a high level of knowledge and skill for the machinery and electronics, he started to introduce various machines into the farmhouse business. He obtained licenses for using his farmhouse business by just studying by himself. But he is no good for the information technology. He started to use the PC and the Internet stimulated by the eldest son, but he is not yet well-accustomed to them and has no specific purpose. Just two years ago, he started using the cell phone by the encouragement of his children. He is using only the calling function now and would like to use it more practically. His wife and eldest son also have a cell phone. Financially he is want for nothing. His mother is sickly and is lying in bed almost all the time.

Fig. 1. Sample Persona

Although the persona and the scenario method brought engineers and designers the information about the realistic image of the user and the realistic description on the use of the artifact, they are not real and are just the outcome of the imagination. It is true that the engineers and designers can get much stimulation and suggestion for their creativity by reading such descriptions. But there is no guarantee if the outcome of their creativity will fit to the real users because the information contained in the persona and the scenario is not real but just the outcome of imagination.

Another problem that have to be pointed out is that the number of persona will usually be limited to several at the maximum. But as can be realized by looking at Table 1, several persona descriptions will not cover the whole range of diversity even if the relevant dimension of people for the design of specific artifact are limited to some of the dimensions listed in Table 1.

What is necessary is more realistic information about the user and the context of use, and the persona description and the scenario description should be more real so that the development of artifact can be valid for the actual usage of that artifact. This is the point that the persona and the scenario descriptions should be based on the real data obtained from the field work of which micro scenario method is emphasizing.

3. Micro Scenario Method

The micro scenario method (MSM) is another approach that directly brings the information about the user, the situation and the problem. Unlike the conventional persona and scenario methods, the MSM uses the real information obtained from the field work thus the information contained in the persona and the scenario is real. From another viewpoint, it is an efficient way to summarize the qualitative information and brings engineers a better understanding of the user. In this aspect, it is similar to the Grounded Theory Approach (GTA) originally proposed by Strauss and Corbin in 1998. But the MSM is more goal-oriented where the goal is the development of the artifact. The initial steps of fragmenting the facts found in the field research and summarizing the problem based on the similarity are similar, but the problem list that will soon be used to seek for the solution is different. It is because the MSM is more goal-oriented.

Following is a general procedure in the MSM. Figure 2 describes the whole steps of the MSM

Fig. 2. Steps in the MSM

(1) Obtain the Field Data

First of all, the researcher should visit the informant and conduct the interview by watching the environment. This is fundamentally the same with the contextual inquiry proposed by Bayer and Holtzblatt (1998). The researcher tries to get the fundamental information about the informant including the general information as is described in Figure 1 and then focus on the topics of the research. If the research is on the educational issue, the researcher should first ask about the life history of informant focusing on the education; the school environment, the subject and the material used for each lecture, the teacher’s skill and attitude, the favourite subject, the companion, the school fee, the parents’ attitude toward the education, the homework, the motivation to learn, etc. In order to get sufficient information, the informant has to provide a list of questions in advance. But it is recommended to adopt the semi-structured interview because the structured interview is too narrow-scoped to get additional information and the non-structured interview has a chance to miss some key information. The researcher is recommended to use the digital recorder in addition to writing the field note. The researcher then asks about the opinion of the informant on the educational policy, the educational environment, important points at the school, the opinion for the e-learning, etc. depending on his/her interest. Usually the research will take about two hours considering the fatigue of the informant. And if more information is needed, visit the informant on the other day.

(2) Write the Persona Description

Based on the information obtained from the contextual inquiry, the researcher describes the persona. The persona description should include the characteristics of the user and the background contextual information about the life of the informant. This information is common to any of the problem micro-scenario and should be referred to afterwards in order to get a better understanding of the pMS. Previously, the persona was called the ground information because this information forms the ground or the base for describing and interpreting the pMS. But it is now called the persona because it was revealed that there is no fundamental difference between the persona and the ground information in its contents and description.

(3) Find out Problems

This step is similar to the open coding of the Grounded Theory Approach in that the fragmental information will be extracted from the field data. But this step in the MSM differs from the open coding of GTA, because only something that was regarded as a problem will be picked up whereas the open coding of GTA picks up any fragments from the original data. The difference lies in the fact that the MSM is a problem-solving activity and the GTA is an open stance theory construction approach. The criterion regarding what to pick up as a problem differs from research to research and depends on the focus of attention or the goal of the research. Some problem will be mentioned as the problem by the informants themselves. But other problem might not be noticed even by the informants. Hence, this step is quite dependent on the sensitivity of the researcher.

(4) Describe pMS (problem Micro Scenario)

Usually the scenario is a FULL description of something including the information about the people who appear in the scenario. But in MSM such information as the characteristics of the informant and the contextual information of the informant will be separately described as the persona, only the description of a problem should be written as a pMS. Important point here is that each pMS describes just a micro problem, in other words, a fragment of the problem. If a problem found in the previous step has 2 or more problem fragments as in the case of problem description as follows: "the informant attended the elementary school where only 2 teachers were in the whole school of 30 pupils and the level of lecture was low because teachers had to take care of different level of pupils from 1st graders to 6th graders". Each fragmental description of problem, i.e. pMS, should be "2 teachers had to take care of 30 pupils ranging from 1st graders to 6th graders" and "the level of teaching was not high because the teacher had to take care of the young pupils".

(5) Describe Tags

Tag is a keyword that represents the key content in the pMS. In above case, "small number of teachers", and "different level of pupils" will be the tags for the pMS "2 teachers had to take care of 30 pupils ranging from 1st graders to 6th graders". Thus the tag is a [list of] word[s] that represent the key content of the pMS. Important point here is that the same tag description should be used all through the pMS and Tag extraction process. It is not good to use "small number of teachers" and "lack of teachers" for different pMSs although they are fundamentally meaning the same thing. The reason is that the tag will be used in the later stage of analysis as a key for the information retrieval. The steps (4) and (5) will be repeated

until all the problem fragments in the problem description in (3) will be converted into pMS and tags. Then the steps (3) + (4) (5) will be repeated until the whole information obtained from the field work will be analyzed.

Fig. 3. Relationship between the fieldwork data and the MSM description as the persona, the pMS, and the tags.

(1)-(5) Repeat this activity until the Saturation

Steps from (1) to (5) should be repeated until the researcher will think that the sufficient data was obtained. In the GTA, it is called the “saturation” that means the moment when the repetition of field work for different informants only gives the similar set of problems and no new finding are collected even if the researcher tried to get new information from a different type of informants. The timing when this saturation will come differs from research to research and usually depends on the size of the focus of the research. There is a research where 6 informants are thought to be enough but there is another case where more informants are needed even after taking the data from 18 informants. Every time when the research is repeated, the data described in Figure 3 will be accumulated.

(6) Collect a Set of pMS with the Same Tag

When it was thought that the researcher have collected enough data, then the researcher moves to this step. This step and the step (7) are for summarizing the problem. Figure 4 describes the situation where 3 sets of data were obtained from 3 different informants. By looking through the tag information, list up all pMSs that have the same tag, i.e. that relate to the same kind of problems. It is recommended to use MS Excel or some database software for recording the pMS and the list of tags. It is quite easy to get a set of pMS that have the same tag by using such a computer program. It is not necessary to repeat this process for all tags but should be done only for the tags that seemed to be important for the researcher. In the case of Figure 4, the second (because the order of pMS is arbitrary, the order doesn't have any significance but just a nominal meaning) pMS for the 1st informant and the first pMS for the 3rd informant were found to have the same tag in their tag lists.

(7) Summarize the Problem

The next step is to summarize the problem that is to take out the common and fundamental information from each pMS that has the same tag information. It is sometimes useful to refer

back to the persona information when it is difficult to interpret the fragmental pMS. The problem description in Figure 4 is such a de-contextualized description of the problem. This step should be repeated until all the necessary retrieval of tag will have done. There will be a set of problem descriptions after this step. An example of the problem description is “the lack of sufficient number of teachers for the numbers of pupils”.

Fig. 4. Summarizing the problem by using the tag information

(8) Consider the Solution
The MSM has two phases, one is focusing on the problem and another is focusing on the solution. The latter phase starts from this step. This step is not supported by any kind of

method. But just the imagination of participants who will join in the stakeholders session will be the only source of ideas to solve the problem. Hence, it is recommended that a variety of stakeholders should get together in this idea generation step including other teachers, the school manager, the designer, the social worker, the local government officers, members of the PTA, etc. in the case of this school issue. Sometimes it will take a long time for considering the solution and usually a set of solution ideas will have to be listed. Usually, one session takes just one problem for about 2 hours and the rest of problems should better be discussed on other days.

(9) Describe sMS (solution Micro Scenario)

If the problem description in (7) were "the lack of sufficient number of teachers for the numbers of pupils", tentative ideas to solve the problem will be "to hire more teachers", "to merge this school to another adjacent school which is much bigger with more number of teachers", "to hire some part-time teachers", etc. These fragmental ideas form the sMS. In the example of Figure 5, three sMS were proposed.

(10) Describe Tags

For the sMS, the tag information is useful but in a different sense from the tag for pMS had. In this case for sMS, tags are criteria for evaluating each solution idea. So the same set of tags will be used for all the sMSs proposed. Thus it could be described as a matrix in Figure 5. The first step is to list up all the relevant criteria for evaluating the pMS. Then write a matrix and evaluate each idea in terms of each tag or the criterion. In the example of Figure 5, tags are the total cost, the preparation time, the distance to school and the mental problems of children. And the point for, for example, the first sMS is 3, 4, 4, 3 respectively.

(11) Calculate the Weighted Sum

Next step is to weight each tag for its importance. It is because each tag does not necessarily have the same weight. There are important aspects but at the same time trivial aspects. In the case of Figure 5, weights are 8, 4, 6, 5 respectively. Then calculate the weighted sum for each sMS by adding the multiplication of weight and point for each tag criterion. In the first case of Figure 5, $8 \times 3 + 4 \times 4 + 6 \times 4 + 5 \times 3 = 79$, and 79 is the weighted sum for the first sMS.

(12) Select the sMS with Maximum Value

The final step is to select the sMS with the highest weighted sum. In the case of Figure 5, the second sMS got the highest score of 97 and after a discussion for confirming the result, it will be adopted to solve the problem.

Fig. 5. The process to deal with the sMS with tags and their weights

As have been described, the MSM is a problem solution method based on the qualitative field work data. But the former half of the method for describing problems as a set of pMS and tag can be used in another way. These data can be stored and be referred to afterwards from a bit different viewpoint. The data will serve as a good source of information in a specific format and if the same tag will be used later, the data will give a different insight. This is the base for an idea of micro scenario database that will be described in the next section.

4. Database of Micro Scenario

It is quite natural that the engineers will have the idea to collaborate with human science professionals so that their development can be more human-centered, i.e. more effective, more efficient, more interesting, and more useful. But based on the experience of the author, it is quite difficult for the collaborative project between engineers and human science professionals to be successful. In one extreme case, the project member that include the engineers and the human science professionals go in parallel from its start and finalizes in such a state as each result being still parallel under the title of an integrative approach. It is quite regretful that such an integrative approach fails by spending a big amount of budget and a long period of time.

Such a misfortune can be caused by some reasons. One big reason is the difference of language or the difference of the scheme among different disciplines. Engineers expect human scientists such as psychologists to give them the information regarding the adequacy of their engineering devices or systems. But the psychological findings are based on the psychological scheme and can not easily be translated into the engineering scheme. This is due to the goal of each discipline. The engineer seeks for inventing and developing some devices or system that are new. But the psychologist looks for the new fact about the nature of human being. Because the psychology is one domain of science, the fact finding and the truth seeking are the fundamental stance of psychologists. There are, of course, applied psychologists who put more emphasis on the application of psychological findings. But the number of such psychologists is not large and furthermore the engineers tend to expect to get new finding from fundamental psychologists rather from applied psychologists.

Another big reason is the temporal factor of the collaborative project. Usually, all the project members start their activity at the same time in such a collaborative project. Human science professionals or sometimes social science professionals start their research activity that they believe to bring about very valuable results in terms of the project goal. But, quite naturally, the research will take a certain amount of time during which the engineers are not waiting for the result to be available for them but will carry out their own approach. Hence, it frequently happens that when the result of the human science research are summarized, the development on the side of engineers have already advanced to a certain stage from which the modification of the development will be difficult. As a result, human engineer professionals summarize their own findings as a report whose content will nothing to do with or in a different direction with the technological development by the engineers.

The idea of the micro scenario database was conceived of for minimizing the risk of such misled integrative approach between the engineers and the human science professionals. Figure 6 describes how the collaboration paradigm should change.

The upper figure shows how the current collaboration projects between engineers and human science professionals or social science professionals are going on assuming the abscissa as a time. They start and end the project at the same time, thus the findings of the human science or the social science may not be able to be used by the engineering development.

The lower figure shows the conceptual scheme for the collaborative project using the micro scenario database. The fundamental idea in this figure is as follows.

- (1) A big project starts with just human science professionals and social science professionals. In that project a number of field work will be conducted in terms of various aspects of human life including the education, the medical treatment, the local government, the unemployment, the development of depopulated area, etc. Obtained data, for example, about the education will, for some part, include something about the unemployment or the local government issues. By conducting the multi-focused field work, mutually linked information will be obtained. Thus it is far better than the research with just one focus.
- (2) The second step is to pick up problems and write down pMSs and tags. Important point is to provide a list of tags to be used in advance. Thus the pMSs containing the same subject will be retrieved by just entering the tag. Of course, it could also be useful to provide a thesaurus for the tag. If it is provided, it is easier to input the tag and retrieve the pMS. pMSs and tags will be stored in a big database from which any information can be retrieved by entering the keyword (tag).
- (3) When the engineers want to start a new project that is related to the human user, they simply retrieve relevant pMSs by entering the keyword (tag) to the system. They will be given pMSs that are related to the subject for which they are going to develop some devices or systems. Sometimes, the partial collaboration of the human science professionals will be necessary for adequately interpreting the pMSs.

Fig. 6. Conceptual Image of the Micro Scenario Database

The micro scenario database will thus facilitate the collaboration between the human science (social science) professionals and the engineers or the designers. Some of the information in the database will be obsolete after a certain length of time, so the field work research to maintain the database should be conducted once per a few years.

5. Conclusion

In this chapter, the diversity among people was explained at first and it was pointed that the diversity of user of any devices or systems should be covered before the beginning of the development process. After reviewing the current persona and scenario method, the micro scenario method was introduced as to summarize the problem information as the pMS and to lead the solution as the sMS. Then the idea of the micro scenario database was introduced.

The author believes this will surely enhance the effective and efficient collaboration between the human science or the social science professionals and the engineers.

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In this book the reader will find a collection of 31 papers presenting different facets of Human Computer Interaction, the result of research projects and experiments as well as new approaches to design user interfaces. The book is organized according to the following main topics in a sequential order: new interaction paradigms, multimodality, usability studies on several interaction mechanisms, human factors, universal design and development methodologies and tools.

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InTech Europe

University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China

Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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