PROPOSAL OF WEB USABILITY BY COMPARISON EXPERIMENT OF PAPER MEDIA AND INTERNET BROWSER THAT CONSIDERS INDIVIDUAL CHARACTERISTICS

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Abstract

This research compares legible of sentences displayed in the paper media and a browser, and examines whether there is a difference legibly of sentences by the experiment. When the result was considered, we considered an individual characteristic of the subject. We considered the problem when sentences displayed in a browser were read, and considered the improvement idea to the problem. Next, we experimented similarly in the environment to which this improvement idea was taken, and verified the effect of the improvement idea. As a result of the research, it has been understood that sentences displayed by a browser are hard to read compared with the paper media. This tendency appears strongly in the subject with individual characteristics of the state intention. We thought was introduced as follows by two points as an improvement idea with hard to read sentences displayed by a browser. Be for the first improvement idea to straighten the format with CSS, and the second improvement idea to introduce a tab browser to show the concept of the page. We were able to verify that the subject became legible as for sentences when the improvement idea was introduced by the experiment. This improvement idea was effective in the subject with an individual characteristic of the risk evasiveness especially. Oppositely, the improvement idea has understood the minus results in the subject with an individual characteristic of the risk orientation.

Key Words

Internet Browser, Web Usability, Individual Characteristics, Legible, Tab Browser

1. Introduction

The personal computer spreads to each home and is used by various scenes in recent years. It is the Internet to occupy a big position as a purpose of use of the personal computer. The initial Internet connected the laboratory of the university with the phone wire, and was used as a place for specialist's information exchange and sharing information. However, the Internet became an age used by the ordinary family as an indispensable tool now. It came to be able to acquire a huge amount of information instantaneously through the homepage and WebLog of the Internet now. As for the Internet, information is sent and received around the character and the image. It is actually understood it doesn't have grounds about this in the experiment [1] that has already been conducted though it had been assumed that it was able to catch user's interest by there are a lot of images and animations before. The character is mainly done to the transmission of information in the Internet.

To read sentences displayed in a browser by using the computer display is to use Electronic media. It is said that Electronic media can read sentences only at the speed of 25% compared with the paper media [2]. In a word, a browser including Internet Explorer is assumed to be hard to read Electronic media though the use frequency is high. There is a problem of not being used even if the
comparison can develop now by occupying the share that Internet Explorer is big though there is a method of newly developing a legible browser as an approach of the solution to this. Then, it is possible to improve the design of the Web site by using an existing browser as another approach.

In this research, the case to read sentences of the Web site written in Japanese by using a browser and the case to read sentences of the paper media are compared, and it is examined whether there is a difference legibly. Moreover, because it is pointed out that there is an influence in use of the online help [3] [4], an individual characteristic examines whether to relate also to the use of a browser. The improvement idea is presented from this experiment result and the effectiveness is verified.

It seems that it is related to the improvement of the Web site design to examine legible of sentences displayed by an existing browser. As a result, the user comes to be able to inspect the Web site efficiently. Moreover, the research data of the Web site design with legible sentences can become becoming the basic data of other Electronic media developments such as electronic books.

2. Individual characteristics selected by this research

We compare the following individual characteristics with the use frequency of the WBT teaching materials. And, I clarify individual characteristics that don't want to use the WBT teaching materials. It is reported that these individual characteristics influence the PC operation by a past research [5][6].

2.1 Action/State Orientation

The action orientation is to try to keep attention to the structure of the act. The state orientation is to try to keep attention my continuing in the acknowledgment in the past and present futures. These are classified into action/state orientation by ACS-90 questionnaire form [7], and consists of the following three subscales:

- Action orientation subsequent failure vs. preoccupation
- Prospective and decision-related action orientation vs. hesitation
- Action orientation during (successful) performance of activities (intrinsic orientation) vs. volatility

2.2 Risk Orientation

The risk orientation is a degree how much the possibility of the risk (= variable) is requested, and the risk is requested oppositely and the avoiding safety is requested. We call the decision making that values the possibility and the person who behaves a risk seeking type. We call the decision making that values safety and the person who behaves a risk averting type. We can distinguish these by the questionnaire form "Lopes's lot" [8].

2.3 Technostress syndrome

The technostress syndrome is divided into the techno-centered and techno-anxious by the pathology phenomenon of the mind and body with whom the person engaged in the computer work is common. At present when the PC spread widely, the symptom is seen even by the person not engaged in the computer work. It is possible to judge by the questionnaire form that consists of 26 questions [9]. There is a possibility that the WBT teaching materials is not used by the stress to PC by the technostress syndrome. Therefore, the technostress syndrome took it to this research though it was not individual characteristics.

2.4 Feeling of operating the personal computer uncomfortably

When becoming a chance to have for people to operate the PC or to operate, people occasionally have disgust for the PC. Moreover, people come to want to run away from the PC by fear and the disgust of the failure by the failure experience of the past occasionally. We call such consideration as feelings of operating PC uncomfortably. We can distinguish whether to have this sense with the questionnaire form [3].

3. Comparison experiment legibly of sentences displayed by paper media and a browser

3.1 Experiment purpose

Sentences of the Web site written in Japanese are compared with sentences of the paper media, and it makes comparative study of whether there is a difference legibly. Moreover, an individual characteristic is examined, and how an individual characteristic influences the use of a browser is examined.

3.2 Experiment method

3.2.1 Subjects

20 students at Suwa Science University of Tokyo with the experience and the skill at the middle person level by which the notebook computer had been bought when entering a school by often using the Internet were assumed to be a subject.
3.2.2 Problem to subject

It makes with Microsoft Word2003 and the subject is answered in the problem of the printed national center test for university (Figure 1) and HTML the problem of the made national center test for university (Figure 2). We used the problem of the national language that a lot of National Center for University Entrance Examination of which the university student in Japan took an examination had made to experiment (40 point full marks).

3.2.2 Procedures

We took a picture of the appearance where the subject grapples with the problem of the paper media with two CCD cameras, and recorded the video. Figure 3 shows the video screen. The time to solve the problem was 20 minutes, and when the answer ended, the time limit or less was permitted to end on the way.

Next, the problem of making it with HTML is answered by using a browser. We recorded the appearance of the subject to grapple with the problem by using a browser in the video with two CCD cameras and down scanning converters. Figure 4 shows the video screen. The time to solve the problem was 20 minutes, and when the answer ended, the time limit or less was permitted to end on the way.

3.3 Results and considerations

3.3.1 About the score difference of the problem

We prepared two kinds of problems expected that the difficulty was the same in the paper media and a browser for the sake of comparison. We confirm whether there is
difference in the difficulty of two kinds of problems. Figure 5 shows the average score of two kinds of problems. The subject of ten people answered Problem A and Problem B was answered by a browser with the paper media. The subject of the remainder of ten people answered Problem A and Problem B was answered with the paper media in a browser.

As a result of t-authorization, the average point did not have a significant difference though Problem B was 0.4 points higher than Problem A. Therefore, it has been understood that there are no differences of the difficulty in Problem A and Problem B.

![Figure 5. Comparison of average points in two kinds of questions](image1)

### 3.3.2 About the score difference when it displays it by the paper media and a browser

Next, it is compared whether there is a difference in the score between the subject using the paper media and the subject using a browser. Figure 6 shows the result.

It is understood that the subject using paper is 4.3 points higher than the subject using a browser. It has been understood that as a result of t-authorization, there is a significant difference in the dangerous rate 5%. Thus, it has been understood that a browser doesn't read sentences easily from the paper media.

![Figure 6. Score when displaying it in paper media and a browser](image2)

### 3.3.3 About the problem achievement time and the problem sentence reference frequency

To investigate the cause with a low score of a browser, the mean value of the frequency in which time (second) until the subject ended the problem and the problem sentence were referred was examined. Figure 7 shows the result. There was no significant difference at time until the problem was ended if the paper media were compared with a browser as a result of t-authorization. However, the frequency in which the problem sentence was referred was dangerous rate 5% and had a significant difference.

Thus, the subject using the paper media can understand the problem sentence from a little reference frequency. As for the subject on the other hand using a browser, it is understood not to be able to understand the problem sentence though there are a lot of reference frequencies of the problem sentence. In a word, the subject using a browser means sentences are not read easily.

![Figure 7. Problem achievement time and problem sentence reference frequency](image3)

### 3.3.4 Difference according to individual characteristic

We introduce action/state orientation of the standard of the failure with a significant difference statistically though four individual characteristics were treated in the experiment. The subject was classified by action/state intention solving the problem by using the paper media and a browser. Figure 8 shows the result that shows the score and the problem achievement time.
Thus, when the subject of the state orientation uses the paper media, the score is high. Oppositely, when this subject uses a browser, it is understood that the score is low. In a word, the subject of the state orientation means sentences feel that a browser that is new media is used reading.

### 3.4 Problem and improvement idea

When a browser was used from the experiment, it was clarified that the following problem existed.

- Scrolling becomes an evil if a browser is used, and the subject doesn't read the problem sentence deliberately.
- As for a browser, there are a lot of numbers of characters of one line, and the subject doesn't read the problem sentence deliberately.
- A browser cannot be written in the problem sentence.
- The improvement ideas of these problems are the following three points.
  - Two from aspect of Web usability
    - The format is brought close to the paper media by using CSS.
    - A tab browser is introduced, and the concept of the page is clarified.
  - One from aspect in interface
    - The plug-in of a browser that writes it on the screen is made.

In this research, HTML that displays the problem sentence based on two improvement ideas propose by the aspect of the Web usability has been improved.

### 4. Verification experiment of improvement idea

#### 4.1 Experiment purpose

The problem is newly made according to two improvement ideas obtained by experimenting on Chapter 3, and the effect is verified.

#### 4.2 Experiment method

It does by the experiment procedure and the subject (ten people) as well as Chapter 3. However, two kinds of of Chapter 3 and most same difficulties were prepared in problem sentence. Figure 9 shows the problem sentence that is introduced CSS, modeled on the paper media, and shown. A tab browser is introduced and the problem sentence to add the concept of the page is shown in Figure 10.

#### 4.3 Results and considerations

#### 4.3.1 Difference of score by problem sentence

Figure 11 shows the average score of the problem sentence before we improve it, the problem sentence to introduce
CSS, and the problem sentence to introduce a tab browser. It was dangerous rate 5% and, as a result of a decentralized analysis, there was a significant difference in the score. In a word, it is shown to have become legible by having improved it.

The purpose of this research was an examination of there was a difference legibly in sentences displayed in the paper media and a browser. In addition, it was an examination whether an individual characteristic influenced the use of a browser. It has been understood not to read sentences of a browser easily by the experiment that compares the paper media in Chapter 3 with a browser. Moreover, the following three improvement ideas were found by analyzing the user's behavior.

1. CSS is displayed and sentences are displayed to the user by a layout near the use paper media.
2. A tab browser is introduced and the concept of the page is given.
3. The plug-in that can be written on the screen is made.

Two improvement ideas of (1) and (2) were able to be introduced among these and to verify the utility by the experiment.

The development of this experiment in the future wants to verify the utility of the improvement idea of unpalatable (3). Next, presenting another improvement idea effective to a lot of people becomes possible by experimenting by the subject that doesn't become a personal computer operation aged.

### 4.3.2 Problem achievement time and problem reference frequency

Three of the problem sentences to introduce the problem sentence before it improves it, the problem sentence to introduce CSS, and a tab browser were compared, and the frequency in which the problem achievement time and the problem sentence are referred is shown in Figure 12. There was no statistical, significant difference at the problem achievement time. However, the frequency in which the problem sentence was referred as a result of a decentralized analysis was dangerous rate 5% and had a significant difference. In a word, the subject means it came to read sentences of a browser deliberately by having introduced CSS and a tab browser.

### 5. Summary and view in the future

The references are as follows:

