Analysis of General Rashness of Reading on a Display

Junko Inada, Makoto Omodani; Course of Electro Photo Optics, Graduate School of Engineering, Tokai University; Hiratsuka, Kanagawa/Japan

Abstract

We have a general tendency to rush readings on a display than on paper. The verification of the rush tendency is our first focus. We assume that readers may feel impatient on a display because it is generally difficult for them to know in what position they are in a document; on a display. In this study, we have quantified the rashness of reading work on a display. We have also investigated essential causes of the rashness on a display. We have measured time consumption for reading a certain length of document in the following three displaying conditions: 1) A whole page show with page partitions, 2) Partial show of a page with page partitions, 3) Partial show of a page with vague page partitions. We have also measured performances of the readers to questionnaires asking contents of the document. The shortest reading time and resulting lowest correct answer rate were shown by the reading condition (3) with partial show of a page besides with vague page partitions. We suppose the subjects hurried in the reading condition where they were not sure how much volume they were going to read and that their correct answer rate naturally decreased as a result of shorter reading time.

1. Introduction

Recently, we could receive information anywhere thanks to the evolution of network. Such a convenience has brought us increase of opportunities of reading text on a display. We often feel, however, that we tend to rush to read on a display compared to on paper.

A recent study has reported that reading speed was faster on a display than on paper [1]. We also have reported that a proofing job on a display showed shorter time consumption and lower error finding rate than that on a paper [2].

An essential question is why we have a tendency to rush to read on a display. It is generally easy for us to know how much we are going to read when we read on paper. On the contrary, it is not always easy for us to know how much we are going to read on a display because of luck of information of physical volume thickness and often luck of position recognition at a page format. It is also difficult for us to realize how much we have just read. Our supposition is that we may not rush even when we read on a display if we can well recognize the volume that we are going to read and that we have just read.

Thus, we have measured reading speed on a display with various showing conditions of pages. We have evaluated how the easiness for us to recognize the reading volume affects to our reading speed.
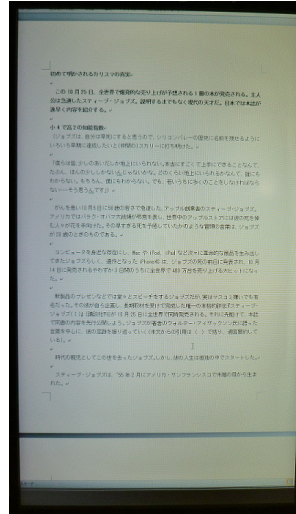
2. Experimental Method

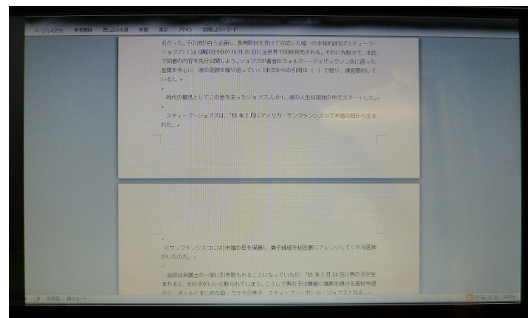Subjects were ordered to read Japanese texts of 5 pages using the following three display conditions.
1) A whole page show with page partitions.
2) Partial show of a page with page partitions.
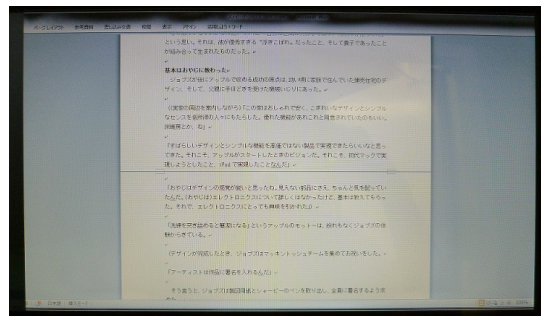3) Partial show of a page with vague page partitions.
Appearances of these three display conditions are shown in Fig. 1.

1) A whole page show with page partitions. (Vertical screen)

2) Partial show of a page with page partitions. (Horizontal screen)

3) Partial show of a page with vague page partitions.(Horizontal screen)

Figure 1 *Three display modes*

We prepared three different texts for the three display condition. The order of the three conditions was rotated in our test; the order of reading task with the three conditions was differently set for each subject. The contents of the text used for the reading task was chosen from different volume of the same Japanese magazine. The subjects were requested to answer to an examination for checking their comprehension level of the text after their reading. Comprehension lever was measured as a correct answer rate for 10 questions asking about the contents of the text. A typical example of comprehension test sheet is shown in Fig. 2.

Table 1 shows the detail of experimental conditions. Paging method was scrolling common to the three display condition. Character size was the same in all the three conditions. Page number was not shown on the display at any of the three conditions. Evaluation indexes ware reading time consumption and correct answer rate. The subjects were six students: twenties.

Choose truths or false for the next 10 descriptions about the text you have read

Question
1. Michael Sandel studied philosophy when he is college student.
2. Michael Sandel thought for the first time about justice when he was 11 years old.

Figure 2   *An example of comprehension test sheet*

Table 1   Experimental conditions

Items		Specs
Environments	Place	Sound-proof room (No glare on displays)
	Illumination	500 lx (on the desk plane)
Screen	Size	29.5cm×16.7cm
	Document format	A4 size (40 characters × 36 lines in a page)
	Font	MS Gothic, 10.5 pt.

3. Experimental Results

Results of all the subjects are shown in Table 2. Figure 3 shows normalized results of averaged reading time. We calculated, for each subject, rate of time consumption for condition (2) and (3) using reading time of each subject in condition (1) as the standard, and then averaged the rates of all the subjects. Figure 4 shows results on correct answer rates.

The condition (3) showed the shortest reading time rate, 0.93, in Fig. 3.The condition (3) also shows lowest correct answer rate in Fig. 4. It must be most difficult in the condition (3), for readers, to recognize their position in the documents, that is, how long they have read and how long they have to read. This is naturally supposed because the condition (3) offer subjects only a partial view of a page and besides only unclear page partitions. We suppose the subjects naturally tended to hurry when they were not sure how much volume they were going to read. We also suppose that their correct answer rate naturally decreased when they rushed and have finished their reading with shorter time consumption.

We consider electronic displays with a whole page view and clear page partition format will be an ideal solution when we want to read important documents slowly and carefully without using printed documents.

Table 2   Results of all the subjects

a)   Reading time (min)

Subjects / Display conditions	A whole page show with page partitions	Partial show of a page with page partitions	Partial show of a page with vague page partitions
A	11.0	10.3	9.2
B	18.1	13.1	8.4
C	9.2	9.2	11.2
D	9.4	11.7	11.7
E	9.9	11.5	10.2
F	14.0	11.8	10.5
Ave.	11.9	11.3	10.2
Standard deviation	3.5	1.3	1.2

b)   Comprehension level (%)

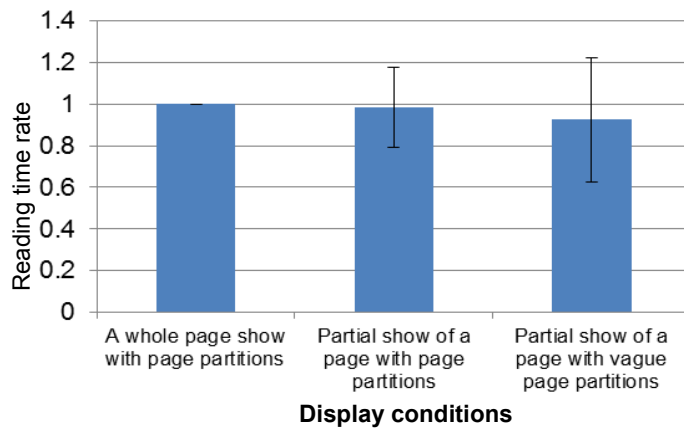| Subjects / Display conditions	A whole page show with page partitions	Partial show of a page with page partitions	Partial show of a page with vague page partitions
A	60	60	50
B	90	70	60
C	60	60	50
D	60	70	70
E	90	80	90
F	70	70	80
Ave.	71.7	68.3	66.7
Standard deviation	14.7	7.5	16.3

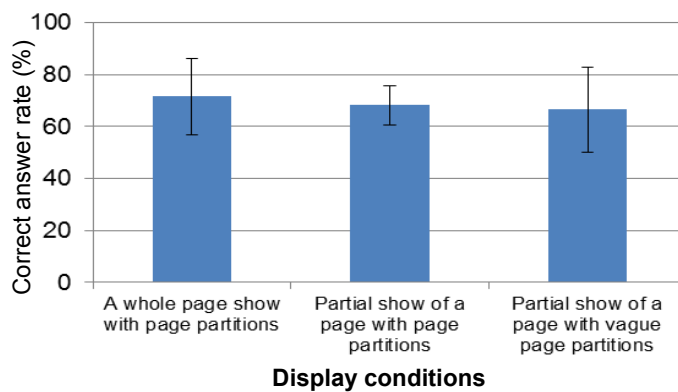*Figure 3   Averaged results of total reading time*

Figure 4   Averaged results of comprehension level

4. Conclusion

We have measured reading speed and correct answer rate on a display with various showing conditions of pages and evaluated how the easiness of recognizing the text volume affects to our reading speed and comprehension level. Essential results are summarized as follows:

1)   The shortest reading time and resulting lowest correct answer rate were shown by the reading condition with partial show of a page besides with vague page partitions.

2)   We suppose the subjects hurried in the reading condition where they were not sure how much volume they were going to read and that their correct answer rate naturally decreased as a result of shorter reading time.

3)   We consider a whole page view with clear page partition format will be an ideal human interface of electronic display for careful readings.

Reference

[1]   Y. Morooka, T. Ishii, S. Ueda, Toward an integrated methodology for the study of the mind, pp.116-119 (2003) [in Japanese].

[2]   M. Omodani, S. Okano, E. Izawa, A. Sugiyama, "Studies on Readability as a Target of Electronic Paper –Current results and suppositions brought by reading experiments on displays and papers-", Journal of the Imaging Society of Japan, 44, No. 2, pp.121-129 (2005) [in Japanese].

[3]   J. Inada, M. Omodani, Performance Comparison of Readings Using a Conventional Book and a Cell-phone, Proc. IS&T's NIP27, pp. 217-220 (2011).

Author Biography

Junko Inada was born in 1988. She received her B.E. degree in 2011 from Tokai University. She is expected to receive her M.E. degree from the graduate school of Tokai University in 2013. She is now engaged in studies of readability as a target of Electronic Paper.