1. INTRODUCTION

Reading is a human intellectual and affective activity as Kansei elaborated. Arthur Schopenhauer (1788-1860) described reading as “reading people’s thoughts”, which is related to thinking about the author’s thoughts and their contents. Readers sometimes feel sad or sympathetic. An approach from Kansei Engineering that tries to unravel the principle is important. The result can be applied to an information system for reading such as social reading.

In recent years, the ever-growing electronic book (“e-book”) market prompt many people to read e-books. Accordingly, readers’ experiences are being shared among other readers of e-books. These are said to be social reading and are drawing attention in this digital era.

In social reading, you read content with comments. What kind of affective influence does this have on readers? In this study, we proposed a method to examine this principle and report the analysis results.

There are various functions in social reading services [1-7], and distinctive functions are provided subsequently. Matsumura et al. [8] show classification by function. Tanishima et al. [9] have constructed a social reading system that shares highlights of contents and comments using tags. They did a class design that allowed reading and sharing of documents. Hasegawa et al. [10] built a social learning environment using social reading. They practiced sharing comments among teachers and learners; the target was a learning material for application software development.

Yamanishi et al. [11] have realized sharing among readers of digital comics. Denshi et al. [12] built a social reading system for scientific literature for laboratories. In that system, annotations such as comments, underline, and freehand descriptions can be added, displayed, and shared digitally. Ribiere et al. [13] proposed “sBook”, a social reading system and analyzed its effects on students.

In this study, we will analyze the social reading sharing of comments from the affective aspect. In particular, we constructed an experimental system and used it for subjects; we also conducted a questionnaire and analyzed what kind of impression it had from factor analysis [14]. Furthermore, the question about reading an e-book while viewing the comments on the contents of the e-book was analyzed from customer satisfaction (CS) analysis. This study shows these results.

The study comprises seven chapters. Chapter 2 describes the research about reading on impression evaluation and the approach of our research. Chapter 3, 4, 5, and 6 describes the experimental design, results of the experiment, factor analysis, and CS analysis, respectively. Chapter 7 concludes the study with feature works. The authors’ contributions were as follows. Matsumura made the document of this paper, implemented the experiment system, and performed the experiments. Nunokawa designed experimentation and performed statistical processing. Sato created the document and designed an experimental system.

ORIGINAL ARTICLE

Potential Factors and Satisfaction of Readers in Social Reading Using Other’s Comments

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Abstract: With the ever-growing “electronic book” (e-book) market, more people are reading e-books. Along with that, social reading, for its social sharing of e-books, has gained more attention; readers may read an e-book while viewing comments on the contents of the e-book. We evaluated the impression of social reading using an experimental system to clarify its effect. Furthermore, we performed factor and customer satisfaction analyses to evaluate the impression. The results indicated that reading while viewing comments is valuable as it gives a sense of excitement and new discoveries. Moreover, we realized that there is a need to improve the method of giving readers satisfaction to “comment writing and enjoyment”.

Keywords: Social reading, Factor analysis, Customer satisfaction analysis
2. RELATED WORK

Many research studies on impression evaluation of reading conventional paper books and e-books have been conducted. Equally, there are numerous studies analyzing the differences between them paper books and ebooks.

The following pertinent studies have analyzed the impressions for paper books; they are similar to our approach because they made the impression evaluation on reading. However, they differ in terms of the media and the reading style (personal or social). For example, Kunimoto et al. [15] analyzed the factors of reading to clarify “what kind of action is reading?”. Focus group interviews were conducted five times with 29 adults. It became clear that reading consists of five factors (object, intention, action, action, place). Miwa [16] made an impression evaluation to clarify the process of emotion formation after reading in novels. As a result, it was shown that “the individual characteristics of the reader tend to be related to the understanding of the character’s emotions”, and “the empathy for the character may affect the emotional state after reading of the reader”. Logan et al. [17] investigated gender differences in reading comprehension and attitude in 232 primary school children among which there were 117 boys. After conducting questionnaires and tests, it became clear that girls had a better attitude toward reading. Also, the gender difference was small for reading comprehension. Morita et al. [18] analyzed the effects of reading poetry on emotional state and relaxation. They compared poetry readings with readings of different documents (manual). The results showed that poetry brings a change of mood to the reader, and it is not related to relaxation.

Since the introduction of e-books, there have been many studies that analyzed impressions of reading e-books. Such studies use the same purpose as ours in terms of media and impression evaluation. However, they differ in terms of sharing with others. For example, Tri-Agif et al. [19] conducted an analysis of the intention to continue using e-books for students in higher education. They performed a factor analysis based on 509 questionnaire data. As a result, the influencing factors (e-book satisfaction, usability, and quality, etc.) became clear. Bal et al. [20] analyzed whether the fictional story in the e-book gives readers empathy. They performed and evaluated two experiments. In experiment 1, they analyzed the effect on sympathy after reading a novel (one week later) whereas, in experiment 2, they analyzed the effect with another book. It was found that the fictional story acts on empathy.

There are also many studies aimed at comparing the impressions of e-books and printed books. In these studies, differences in media are recognized as important issues, and they aim to clarify the difference. In the following cases, impression evaluation was performed. For example, Bao et al. [21] conducted a comparative evaluation using the SD method to clarify the difference between paper books and e-books. They chose 34 participants as university students and asked them to read the comics and magazines in each medium; they were also asked to complete the questionnaire. It was found that familiarity is important for the evaluation of books and that a better experience is provided because paper books are more popular than e-books. Dundar et al. [22] compared e-books and paper books in reading comprehension and speed in 20 elementary school students. After conducting a quantitative and qualitative survey, it became clear that there was no difference between reading ability and speed in each medium. In addition, it was revealed that the students responded positively to the use of the e-book.

As mentioned above, there are many cases of impression evaluation in research on reading. Impression evaluation is performed when analyzing each medium and when analyzing the difference among them. It is thus important to study impression evaluation on reading. Analysis of differences in media is also important in research on reading. Therefore, it is important to evaluate the impression of social reading.

3. EXPERIMENTAL DESIGN

Figure 1 shows an example of the social reading system we are assuming. The number of reactions is displayed as a line graph on the top. In the lower part, the contents of comments are indicated by contextual menu. We implemented this lower part and used it as an experimental device. Participants in the experiment are 11 university students who are familiar with computer literacy.

We considered the experiment from two points of view: (1) sharing method - there are generally three kinds of sharing methods in social reading, viz. sharing before reading, sharing during reading, and sharing after reading [8]; and (2) social reading. We set four points of view on social reading:

(2.1) What is related to the books themselves,
(2.2) what about the information to share,
(2.3) about reading related to sharing, and
(2.4) writing the comment by themselves.
In this study, we show these experimental results on what kind of impression is given to (2.3) and (2.4) in sharing during reading.

The book used in the experiment is “school of village (true story) (Alphonse Daudet, translated by Miekichi Suzuki)” in Aozora Bunko [23]. We presented the second half of this book to the participants for reading. For this, we asked for an assessment with the questionnaire shown in Figure 2.

The questions (1)–(6) were related to (2.3) above, and question (7) was related to (2.4). Question (8) is a rating of the impression from a comprehensive perspective on sharing during reading. The questions were prepared to clarify how the impression of “reading while viewing comments” relates to each item of (1)–(7).

4. EXPERIMENTAL RESULTS

Figure 3 displays questionnaire results that show the mean and standard deviation (SD) for Q301-Q308T, and correlation coefficient (r) for Q308T (Overall satisfaction).

From the results of Q308T, it shows that the mean value for satisfaction of reading while viewing comments is high. The mean and r of Q307 are markedly lower than others. That is, for reading while sharing a comment, they have a good impression on reading; however, it seems that they do not have a good impression of writing their own comments.

Q303 (I enjoyed reading more) has more responses compared to others (SD = 0.7). In fact, half of the 55% is concentrated in the score 4, i.e., while reading the comments of others, we may conclude that there were many people who enjoyed reading more.
5. FACTOR ANALYSIS

We conducted a factor analysis to clarify the potential impressions of readers on reading while reading comments. Based on the scree plot, multiple factors were rotated with 2 factors. As a result, the cumulative contribution rate did not change around 0.6 for each rotation. Therefore, the one with varimax rotation was adopted from the ease of interpretation. The results are shown in Figure 4.

From factor analysis, we named the first factor as readability because the factor loadings of easier to read (Q301), understood more (Q302), and faster interpretation (Q305) are remarkably high. We named the second-factor exciting feeling. This is because the factor loading newer interpretation (Q304) and faster interpretation are notably high. For this reason, it can be concluded that they have these two potential impressions regarding reading while commenting.

From Figure 4 (b), each item can be classified into three clusters. Figure 4 (b) is divided into three clusters by k-means as item colored. One is a cluster consisting of enjoyed (Q303), time increased (Q306) and wanted to comment (Q307). This cluster (written in red) could express the impression of reading pleasure.

The other is a cluster (written in green) consisting of easier to read, understood more, and faster interpretation. It seems that this cluster expresses the impression that reading is done efficiently.

The last one is the newer interpretation. This exists at a position that is distant from the two clusters; this shows that another reading method was found by reading while watching a comment.

6. CS ANALYSIS

We performed customer satisfaction analysis (CS analysis) used in marketing to analyze the impression of readers for reading while viewing comments and discuss improvements. CS analyzes how a customer is satisfied with a product (e.g., a hotel accommodation service). In general, this is a method for obtaining multiple items representing products (e.g., in the case of hotel accommodation services, the reception desk, clean rooms, meals, etc.), and an overall satisfaction rating of the products (if it is a hotel accommodation service, the overall rating). CS analysis is the analyzing of which items affect overall satisfaction (rating).

There are various actual calculation methods. For example, (1) multiple regression analysis with multiple representative items as independent variables, and overall satisfaction as a dependent variable [24]. In this method, a mathematical model is created, and the operation items that improve satisfaction are examined by using it as an evaluation function; (2) a method for analyzing satisfaction by finding the overall satisfaction, and the correlation between multiple items [25, 26]. In this method, the improvement items are discussed by plotting each item and the correlation between them and satisfaction.

We proposed the following method based on the method (2) above to discuss improvement items related to reading while viewing comments and to analyze the reader’s impressions. Let us call this method Method 3. It plots each item and the correlation between those items and satisfaction based on method (2) and clarifies the reader’s potential impression by performing clustering.
Specifically, our CS analysis enables discussions to improve overall satisfaction with the following procedures (1)–(4): (1) find the overall impression (overall satisfaction, Q308) and the correlation (impact) between the impression of the element (Q301–Q307), (2) plot the results together with the average (current status) on a 2D plane (thus, the degree of influence on the overall satisfaction level of each element, and the current situation are clarified), (3) divide the plotted figure into four quadrants, (4) cluster each item in the plotted figure and discuss it.

The axes of the plotted figure are described hereunder. The vertical axis is the average value of each question item and represents the current situation. The horizontal axis is the correlation between them and their overall satisfaction. From this figure, the current status of each item (vertical axis) and the degree of influence on their overall satisfaction (horizontal axis) can be seen. A policy to raise the overall satisfaction level by visually grasping the items that are effective to control the overall satisfaction could be obtained.

To increase overall satisfaction in CS analysis, it is better to deal with elements with a high correlation at first. In particular, it is better to deal with top priority if the current average value is low (quadrant 4). Conversely, the one with the smallest value for each axis (third quadrant) is the lowest priority.

In CS analysis, improving an element in the third quadrant is considered inefficient and there is little improvement in that element. However, this is not the case in our study. For example, in “reading while viewing comments” targeted by our research, even if wanted to comment (Q307) is plotted in the third quadrant, it is necessary to control to realize sharing. Therefore, it is essential to analyze according to the actual situation of our research object. Also, if necessary, we need to address the element even if it is not efficient.

Figure 5 plots our experimental results by CS analysis. We drew dotted lines at the mean of value each axis to facilitate discussion. In addition, clustering was performed using the k-means method (the cluster is represented by three colors (black, green, red)). As seen in Figure 5, the reading performed while viewing comments is mainly composed of three quadrants; these are the elements in the first quadrant, easier to read (Q301), understood more (Q302), new interpretation (Q304), and faster understanding (Q305), elements in the second quadrant, enjoyed (Q303), and elements in the third quadrant, time increased (Q306), and wanted to comment (Q307).

We discussed the relationship between mean and r. The elements in the first quadrant were summarized as "whether the book could be better understood" or "does not disturb reading". Furthermore, in the second quadrant, there was an element of enjoyed. Readers were more satisfied with reading books than enjoying the comments.

In the third quadrant, wanted to comment was a particularly small value. This could be attributed to the reader feeling more satisfied with reading the comment than writing the comment.

From the results of the fourth quadrant, in the current “reading while viewing comments”, important factors related to satisfaction were accomplished. This means that there are few factors to be improved in CS analysis, which may be a good result. However, the reader’s main interest in reading while viewing comments is, based on the discussion in quadrants 1–3, “reading a book.” Therefore, in social reading, the point of having fun by viewing a comment and the point of sharing with others is not enough.

We discussed the results of clustering. Looking at the cluster of each element from the point of satisfaction, it can be classified into: the black cluster “easier to read (Q301), understood more (Q302)”, the green cluster “enjoyed (Q303), new interpretation (Q304), faster understanding (Q305)”, the red cluster “time increased (Q306), and wanted to comment (Q307)”. The black cluster is considered to indicate satisfaction with the comfort of conventional reading; the contents can be understood more deeply by reading the comments and the books become easier to read. In addition, the green cluster is considered to indicate satisfaction with the experience that is not found in conventional reading, which is newly generated by comments such as fun and new interpretation. The red cluster is considered to indicate a new burden caused by comment sharing such as writing comments or increasing the time required to read comments, considering that it is in the fourth quadrant.
Readers’ satisfaction with reading while viewing comments can be obtained by factors that make conventional reading comfortable because the black cluster is in the best quadrant. In addition, as the red cluster indicates, readers were not satisfied with the new burden brought about by the comments. However, as the green cluster shows, the new experience provided by the comments has been shown to satisfy the reader.

7. CONCLUSION

In this study, the components of the impression of reading while viewing comments in social reading, and their relationship were clarified. In particular, these were obtained from factor and CS analysis. As a result, factor analysis revealed the following three points: (1-1) readers are skeptical to write comments while reading; (1-2) reading while viewing comments is composed of two latent factors of readability and excitement; (1-3) readers have the impression of three clusters of reading fun, reading efficiently, and a new discovery. As a result, from factor analysis, reading while viewing comments is considered a valuable act because readers can get excited and reveal new findings.

Furthermore, the following four points were found regarding the satisfaction of reading while viewing comments from the results of CS analysis: (2-1) readers feel more satisfied with reading e-books than reading comments; (2-2) readers feel more satisfied with reading comments than writing comments; (2-3) among the elements related to satisfaction of comment sharing, there is no element in the 4th quadrant, and elements that affect the reader’s satisfaction are satisfied except for writing comments (3rd quadrant); (2-4) readers have the impression of three clusters (comfortable reading, new experiences, and hardships for sharing). As a result, from factor analysis, reading comfort while viewing comments can be considered a valuable act because readers were satisfied with comfortable reading and a new experience. However, those satisfactions are mainly for reading comments, indicating that they may not be satisfied with writing comments.

We conclude that reading while viewing comments in social reading is a valuable act. For this reason, we can expect a new reading called social reading.

In addition, we conclude that our proposed analysis method is effective in social reading because readers’ impressions of comments in social reading were obtained. In particular, the following two effects are notable: (1) by using factor analysis and clustering the results, potential reader factors in social reading and their relationships can be found; (2) using CS analysis, and clustering them, “the improvement item and impression from the viewpoint of satisfaction” of the target social reading can be obtained. This result is considered to be meaningful as an analytical method in social reading.

For reading while reading the comments, the following questions for improvement were posed:

(1) What should we do to support the fun of reading while viewing comments?
(2) What should we do to improve satisfaction with comment writing?
(3) What is the design of a system that meets these requirements?

We have already completed the experiments (2.1) to (2.4) for (1.1) and (1.2) mentioned in Chapter 3, respectively. In our future work, we will add and analyze these experiments.

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