A study on the possibility of design evaluation by the Boolean algebra approach

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ABSTRACT

Our research was made to evaluate usability and design relating to homepage of Public libraries. Evaluation methods were the GUI design checklist, and the Boolean algebraic approach that is considered as useful technique as evaluation method.

Keywords: the Boolean algebraic approach, GUI design checklist, truth list, logical equation

1. Introduction

In this study, we review the possibility of evaluation methods as for usability and design by using the Boolean algebra approach defined by Dr. Charles Ragain. The Boolean algebra approach seems to be useful technique to understand cause and effect for social phenomenon. The evaluation methods relating to usability and design. These evaluation methods intend to extract problems in details mainly but there are scarcely any methods to find the problems macroscopically. Therefore, we study the Boolean algebraic approach to understand the problems macroscopically.

The purpose of this research is to compare the Boolean algebraic approach with the GUI design checklist.

As the result, the Boolean algebraic approach was the useful technique for usability and designing.

2. Method

By the GUI design checklist and the Boolean algebra approach, our research was made by eight participants, women over twenty years old of not studied design, and was executed, as for eleven Public library sites covering Western Japan. In addition, the screen dimension of PC to be used was 1,920 × 1,080. Western Japan was selected based on the information of “Japan Library Association”. Using the GUI design checklist means individual evaluation, and is enable to estimate evaluation items from the micro viewpoint. By using the Boolean algebra approach, examiners extracted good characteristics on these Public library sites. When the Boolean algebra approach was compared with the GUI design checklist, the Boolean algebra approach is suitable for finding the combination of evaluation items.

The GUI design checklist consists of sixteen items. Evaluation standard consists of five grades, from the top grade as “5” point to the bottom grade as “1” point. If examiners who evaluated over 3 point occupied the majority, we showed “1” and, if in case of less than 3 point occupied the majority, we showed “0”.

The Boolean algebra approach to the evaluation items are (A): At one glance, required references can be shown without scrolling or not, (B): Whether there is a voice guide or not, (C): Whether the impression of design can represent unique and consistency or not and (R): Whether you want to use website again or not. According to the GUI design checklist, (A) is “Whether there are clues or not”, (B) is “Whether there is feedback or not”. (C) is “Whether the design of the site is consistent or not”.

3. Results

As the results of this evaluation, examiners reported that items had still enough room for improvement in design. In GUI design checklist including 16 items, No (10) is to be expected because of difficulty to evaluate. In addition, Nos, (1), (4), (8), (11) are not reached the level of evaluation, there are more rooms to improve as design evaluation.
The data by the Boolean algebraic approach are shown in truth table list (Table 1). In truth table list, the data shown as “1” represent large letters (A, B, C), and the data shown as “0” represent small letters (a, b, c). Logical equations by the above data represent as follows: “AbC, aBC, ABC”. Then, there equations are represented accordingly: “AbC+aBC→AC, aBC+ABC→BC”. The figure which performed an abridgement is Figure 2. Therefore, they are shown as “AC+BC→A and C or B and C.”. Also, it can be interpreted as “AC+BC=C(A+B)”. From this formula, it can be said that necessary condition is (C). Even by evaluating items strictly, all the evaluation results were the same result. In other words, this evaluation method was sufficient even if one person studied it.

### Table 1. Truth list of the Public library homepage

| Prefecture | A | B | C | R |
|------------|---|---|---|---|
| Shiga      | 1 | 0 | 1 | 1 |
| Kyoto      | 1 | 0 | 1 | 1 |
| Osaka      | 1 | 0 | 1 | 1 |
| Hyogo      | 1 | 0 | 0 | 0 |
| Nara       | 1 | 0 | 1 | 1 |
| Wakayama   | 1 | 0 | 1 | 1 |
| Tottori    | 1 | 1 | 1 | 1 |
| Shimane    | 1 | 1 | 1 | 1 |
| Okayama    | 0 | 1 | 1 | 1 |
| Hiroshima  | 0 | 1 | 1 | 1 |
| Yamaguchi  | 1 | 0 | 1 | 1 |

![Figure 1. The result of evaluation by GUI design check list](image1)

![Figure 2. The mean of the evaluation for the Public library homepage](image2)

### 4. Conclusion

The GUI design checklist has many items to evaluate individually and in details.

On the other hand, the Boolean algebra approach is useful for evaluation of usability and design as a whole. Using the Boolean algebra approach, the high and appropriate evaluation can be obtained by good combinations and necessary condition can be found. In order to attain one evaluation, many causes and factors are related and chained. I thought that I contributed to the improvement for the evaluation more easily by performing logical equation. In order to enhance usability and design, it is necessary to find key points to gain good evaluation and to improve them if any.

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