Usability Evaluation of Graphic Design for Ilmu's Interface

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Abstract. Graphic design is fundamental to Ilmu's interface (i.e. WebOPAC for children) and is the focus of this study. A usability evaluation is carried out for the new prototype of Ilmu's interface which gives the emphasis to the components of graphic design. Questionnaire and observation methods are used to accumulate the usability data. The usability of Ilmu's new interface is shown to be significantly better through t-testing, and statistical testing using chi square (χ^2).

Keywords: Usability, graphic design and children's interface.

1 Introduction

Ilmu is a WebOPAC application used as an information resource throughout Malaysia to facilitate the location of references and the analysis of bibliographical information by students. Graphic design plays an important role in arranging or placing information on children's interface of WebOPAC, and Ilmu needs enhancement in its graphical design as this factor receives the highest ranking in contributing to the usability problems [1]. A new prototype of Ilmu (Ilmu_2) is implemented to demonstrate the usability of the existing interface (Ilmu_1) that can be upgraded. An effective and user-friendly graphic design depends on the use of space, content arrangement, functional accessory and color coordination. Hence, those elements are the focus of improvisation of Ilmu_2 design.

The use of space plays a vital role in generating hierarchical information. Non-hierarchical information, can cause user disorientation [2]. Users will lose interest when their searching and surfing objectives are not accomplished. Hierarchy within information helps the user to determine current location and status.

Control functions act as an intermediate object or pictorial icon - an accessory set apart from text and which serves to implement a function. Examples are the Icons '*help*', '*back and previous*' on instruction buttons and the label '*X*', '*EXIT*' which describes a function. An animated character acts as an assistant to enhance the usage of the function and improve user's understanding. Color coordination is very important in graphic design as it helps the site to look interesting enough for the system interface [3]. The choice of colors must be appropriate and consistent throughout the whole site as to create a standardization effect [4] and [5].

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2 Hypotheses

The objective of carrying out the usability evaluation is to determine whether there is a significant difference and effects between Ilmu_1 and Ilmu_2 designs. The following five hypotheses serve the basis for conducting a usability evaluation of Ilmu's interface:

H1. There is a significant difference between the use of space in the Ilmu_1 and Ilmu_2 designs.
H2. There is a significant difference in the content arrangement between Ilmu_1 and Ilmu_2 designs.
H3. There is a significant difference for the functional accessory between Ilmu_1 and Ilmu_2 designs.
H4. There is a significant difference in the color coordination arrangement between Ilmu_1 and Ilmu_2 designs.
H5. There is an excellent level of acceptance by Malaysian students of the new Ilmu_2, design.

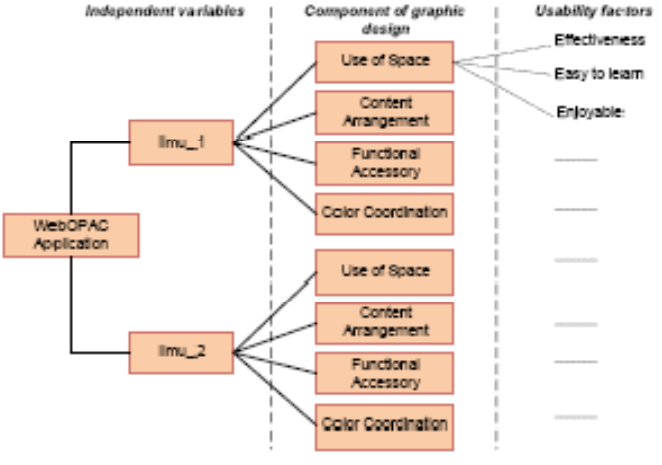

Fig. 1. Relationship of independent variables between Ilmu_1 and Ilmu_2

The main aim of hypotheses 1 – 4(H1 – H4) is to demonstrate any significant difference of usability score between Ilmu_1 and Ilmu_2. This is tested using t-test (paired sample test). Figure 1 shows the independent variables (Ilmu_1 and Ilmu_2), the components of graphic design (use of space, content arrangement, functional accessory, and color coordination – which are the main focus of Ilmu_2 design), and the usability factors for each component of graphic design. Usability factors used in this research are the effectiveness, accessibility, easy to learn, and enjoyable. The aim of hypothesis 5 (H5) is to observe student's perspective towards Ilmu_2's graphic design (use of space, content arrangement, functional accessory, and color coordination) in relation to the usability factors, hence, making conclusion the level of acceptance by students of Ilmu_2's interface. This is tested using chi-square (χ^2).

3 Usability Evaluation Methods

Two usability evaluation techniques were applied, which involved students providing feedback via a questionnaire and observing students interaction with Ilmu_2 interface. One hundred students participated in the questionnaire exercise while twenty students were involved in the observation process.

3.1 Questionnaire

The survey required the students to answer the questions using a 1-5 Likert scale range. A t-test (*paired sample t-test*) was applied to monitor any significant difference of usability score between the Ilmu_1 and Ilmu_2 designs.

3.2 Observation

The observation required the researcher to observe children's behavior and the understanding and ability to search and browse books using Ilmu_2. As to ensure that data is collected consistently from the students during the observation, a checklist is used to record the findings, concentrating on the four components of graphic design. The data was gathered quantitatively according to the measurement criteria categorized by Dumas and Redish [6].

Excellent	Ilmu_2 interface is effective, practical and easy to learn to search for the bibliographic information
Acceptable	Students are satisfied with the searching
Unacceptable	Ilmu_2 interface is not 'OK'. Students are having difficulties using Ilmu_2 interface to search for the bibliographic information

4 The Results of Usability Evaluation

Figure 2 shows the range of mean scores for the components of graphic design between Ilmu_1 and Ilmu_2. The usability score of Ilmu_2 interface shows an increase of 1.56 points for use of space, 1.58 points for content arrangement, 1.61 points for functional accessory and 1.12 points for color coordination.

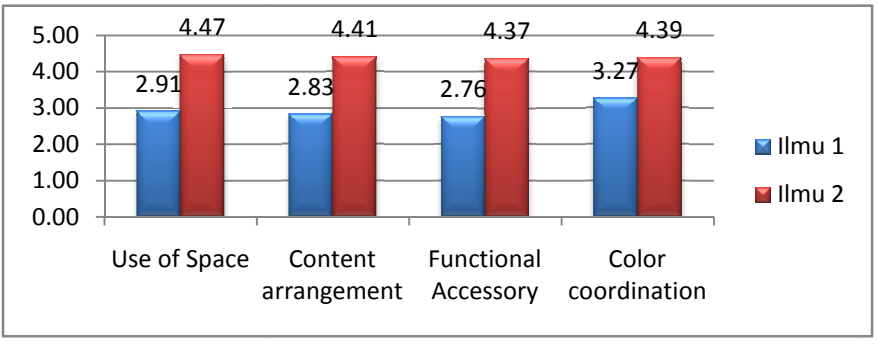

Fig. 2. Mean scores of Ilmu_1 and Ilmu_2 for the components of graphic design

4.1 Results of H1

As shown in figure 2, there is a significant difference between the use of space in Ilmu_1 and Ilmu_2 ($t = 39.546$, $p < .05$). Table 1 shows the mean scores and percentages of usability factors for use of space component. Ilmu_2 has recorded a positive increase in the easy to learn and enjoyable factors.

Table 1. Use of Space Component

Usability Factors	Mean Score	Percentage
Effectiveness	4.43	33.05%
Easy to learn	4.87	33.47%
Enjoyable	4.87	33.47%

A walkthrough technique played a major role in the improvement of the use of space in Ilmu_2. Through its implementation, students are allowed to move the mouse (cursor) to the right or left during their 360° environment exploration. Students are free to explore and carry out daily activities on the screen without any assistance from teachers or their elders.

4.2 Results of H2

There is also a significant difference for content arrangement between Ilmu_1 and Ilmu_2 ($t = 37.954$, $p < .05$). The strength of content arrangement in Ilmu_2 lies on the application of *tree-maps* technique. Text and graphic types of information are displayed hierarchically and in a structured manner which enhances the usability of Ilmu_2. The location of objects such as menu, instructions, buttons, lines and images was aligned horizontally with the movement of the mouse (to the left and right) during the exploration. A comic-strip technique was implemented in performing the arrangement of sub-subject folders in a cabinet.

Table 2. Content Arrangement Component

Usability Factors	Mean Score	Percentage
Effectiveness	4.462	33.73%
Easy to learn	4.378	33.09%
Enjoyable	4.39	33.18%

4.3 Results of H3

As shown in figure 2, functional accessory has the most significant difference between Ilmu_1 and Ilmu_2 ($t = 39.304$, $p < .05$). This component in Imu_2 lies in the deployment of a label function, animation function, terminology and the caterpillar character that act as an assistant. Students were satisfied and it is easy for them to use Ilmu_2 on their own. A clear and concise set of instructions on the menu using bigger fonts provided the easy access.

Table 3. Functional Accessory Component

Usability Factors	Mean Score	Percentage
Effectiveness	4.365	33.32%
Easy to learn	4.39	33.51%
Enjoyable	4.345	33.17%

4.4 Results of H4

Color coordination has the least significant difference between Ilmu_1 and Ilmu_2 ($t = 24.485$, $p < .05$). Ilmu_2 uses a combination of light and cheerful colors. Appropriate selection of colors adds to the student's enjoyment as they feel happy and comfortable while they search and surf.

Table 4. Color Coordination Component

Usability Factors	Mean Score	Percentage
Effectiveness	4.47	33.91%
Easy to learn	4.383	33.25%
Enjoyable	4.33	32.84%

4.5 Results of H5

Results obtained from the statistical evaluation using the chi-square (χ^2) shows scattered data for the excellent and acceptable parameters to be χ^2 (10, N = 30) = 240.8, $p < 0.05$. Table 5 shows excellent feedback from students at a level of 83.93% and none rejected Ilmu_2.

Table 5. Students' acceptability towards Ilmu_2

Adaptability	Mean Score	Percentage
Excellent	23.5	83.93%
Acceptable	4.5	16.07%
Unacceptable	0	0%

5 Conclusion

Graphic design is a vital element to creating children's WebOPAC. The usability of Ilmu_2 is shown to be significantly better through t-testing, and statistical testing using chi square (χ^2). Table 6 compares the graphic design techniques applied between Ilmu_1 and Ilmu_2.

Table 6. Comparison of the application of graphic design techniques

Graphic Design	Searching Technique	Ilmu_1 Interface	Ilmu_2 Interface
Use of space	Keyword	Exact match Boolean Operation	Exact match
	Subject	Image or text hyperlink	Image or text hyperlink
	Location	-	*Pan/zoom*
Content Arrangement	Keyword	Non hierarchical	Hierarchical *(tree-maps)*
	Subject	Non hierarchical	Hierarchical (*Comic strip)*
	Location	-	*Magnification glass (Lens)*
Functional Accessory	Keyword	Use of label, icon and button	Use of label, icon and button.
	Subject	Use of label, icon and button	Use of label, icon, button and image Worm character (interface agent)
	Location	-	Use of label, icon, button and image Caterpillar character (interface agent)

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