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Research Article

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Usability Study on List Pages of Management Information System: For the Case of MIS of a Financial Software Company

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ABSTRACT

Based on usability tests, the relevant user data about the MIS is collected. By analyzing the data by the means of mathematical statistics, how length and background color of the list pages influence usability of enterprise management information system are explored. Based on that, the paper proposes an improvement program of list pages' length and background color which can improve the usability of MIS.

Key words: Usability, Management Information System, List pages

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INTRODUCTION

Management Information System (MIS) originated from the United States in the late 1960s. The founder of MIS theory, Gordon B. Davies from University of Minnesota defined MIS as "User - machine system which can analysis, plan, control and decide model and database with computer software and hardware". MIS can evaluate an enterprise's present situation and forecast its developing trend through analyzing existing data, and then form business decisions with consideration of the whole situation, finally help the enterprise achieve original goals with the condition of enterprise is controlled by information [1]. Nowadays, with the rapid development of technology and information, more and more companies give it highest priority to build MIS with their own characteristics.

According to the domestic and overseas researches of MIS characters, we all agree with that, as one of the most popular platform, MIS has duplicate properties of "technology - society"[2-6], which means after completing tasks with technologies, MIS puts more attention on user reflection. With the fact of MIS's technology attribute keep strengthening, study on social property has already been a bottleneck of MIS's development, to solve this problem, scholars are moving their study point on optimizing MIS's social property. Domestic scholars such as Dinghui Zhang and Jing Li had discussed the relationship between interactive design and MIS's social property, then came up with the design of improving usability as a breakthrough point to strengthen the social property [7-8]. And overseas scholars like Pal and Yogendra (1999) had also tried to integrate Interaction design concept into the MIS development [9].

As a very significant part of MIS, list pages are widely used in system modules, such as information retrieves and file managers, which are founded on list pages. As a result, how to present a list page can influence not only user satisfaction but also system retrieval efficiency. Researchers are becoming to attach more and more importance to list pages which work for MIS's social property. For example, Linxiang Fang once deeply studied and improved general list pages' basic framework, inheritance mechanism, event processing mechanism, data loading and data presenting by means of MVC and other design patterns [10]. However researches focused on the relationship between list pages' presentation modes and user efficiency are still not enough.

DESCRIPTION OF THE RESEARCH

Based on the above background, the paper plans to start from MIS's list pages with both quantitative analysis and qualitative analysis method, taking usability test of high-fidelity models, to collect the data of real reaction when users face list pages with different properties, and then judging how different properties will influence usability of list pages, finally, the paper puts forward an optimal rendering mode of list page, which suits with a certain type of system. The target of the paper is to promote list pages of enterprise MIS and the system availability, and to make up the research of MIS's social property by study different user reactions.

METHOD

This paper takes the method of usability test and analysis the data with mathematical statistics. Usability test measures typical users' behavior of a certain task [11].Compared with other methods, this one is more rigorous and more effective to help us understand the relationship between independent variables and dependent variables better.

Real data was collected when subjects faced different list pages, and then it was analyzed by variance analysis based on mathematical statistics. In order to study the influence of list-style, this paper has designed two groups of experiment aiming at the entries' pages number and background color.

SUBJECTS

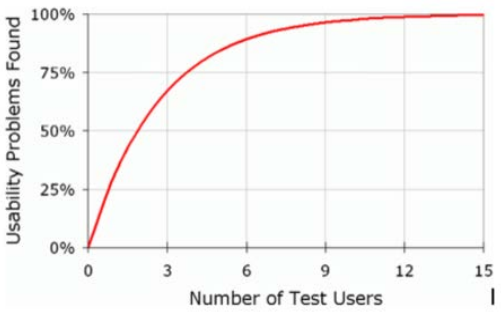

Fig.1 Relationship between problems found and number of test users

Nielsen's research shows that there is a steady increasing tendency of usability problem found when the number of test user is below 9, after 9 the trend is not as obvious as before. From the figure we can see that in an availability test, 10 subjects are enough to figure out 95% problems, with number increasing, problems are becoming difficult to be found, which means the efficiency of the test is reduced.

Fig. 2 the Entries were shown on each page

According to fig. 1, 10 subjects were chosen to take part in the tests, and all of them were between 25 to 45 years old. To reduce the impact of accidental error and ensure to get at least 10 groups of valid data, 12 test users were involved (including 6 males and 6 females).

USABILITY TEST ON LIST LENGTH

EXPERIMENTAL DESIGN

In this experiment the high-fidelity models were made by software Axure. Before the test, 10Comparison group were prepared, and 100 entries were grouped by 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 per page (10 entries were shown on each page in figure 2-1). During the test, subjects were asked to pick one certain entry from each group, and their response time was recorded. With all the collected information, the paper studied deeply on the relationship between entry number per page and subjects' response timeto get a relation curve, finally to get the most preferable entry number per page.

Testing sequence was disrupted to avoid its effects on data, and different searching targets were set for each group. All the tests were made on same equipment to eliminate systematic errors caused by different loading rate.

Influenced by system error, 1 group data was Invalid, so the left 11 groups' valid data was collected.
In order to reduce individual difference, firstly the analysis calculated standardized data according to the formula $a=x/\bar{X}$ (Tab.1), and then got the mean value table of each group's response time (Tab.2).

Tab. 1 the Standardized data for test 1

group	standardized data										
10	1.68	2.11	2.46	1.86	2.00	1.88	2.11	2.10	2.11	2.04	2.16
20	1.11	0.80	1.23	1.20	1.08	1.32	1.27	1.38	1.28	1.29	0.94
30	1.00	0.63	1.01	0.98	0.85	0.96	0.99	0.94	0.98	0.82	1.22
40	0.84	0.91	1.01	0.93	0.77	0.86	0.92	0.72	0.98	0.82	0.94
50	0.79	0.91	0.80	0.87	0.69	0.81	0.77	0.72	0.75	0.61	0.65
60	1.11	0.63	0.87	0.77	0.62	0.71	0.49	0.72	0.60	0.54	0.94
70	0.74	0.80	0.58	0.71	0.54	0.71	0.56	0.66	0.68	0.54	0.94
80	0.95	1.14	0.72	0.82	0.85	0.86	0.77	0.66	0.75	0.75	0.72
90	0.89	1.09	0.51	0.82	1.08	0.91	1.13	1.10	1.20	1.36	0.79
100	0.89	0.97	0.80	1.04	1.54	0.96	0.99	0.99	0.68	1.22	0.72

Tab. 2 the Mean value table for test 1

group	10	20	30	40	50	60	70	80	90	100
Mean	2.05	1.17	0.94	0.88	0.76	0.73	0.68	0.82	0.99	0.98

As is shown the tab.2 , when 70 entries were listed on every page, it would take the shortest time for users to find their target, so we compared point 70 to conduct difference test with other points. Test 1 was a small sample experiment, assuming population variances are not equal, so the simples obey t distribution in the range of 20.

DOF= 2(n-1)=20

When point 70 compared with point 80, suppose:
H_0:ì$_1$-ì$_2$=0 ;H_1:ì$_1$-ì$_2$≠0 (ì was the population mean value)

We can get:$t=\dfrac{\overline{X1}-\overline{X2}}{\sqrt{\dfrac{S1^2}{n}+\dfrac{S2^2}{n}}}$ =2.68

($S1^2$、$S2^2$ were sample variance; X_1、X_2 were sample average; n was sample size)
When significance level á=0.05, critical value of t distribution is 2.086.

Since |t|=2.68＞2.086, it turned out to be a significant difference between two simples.
In the same way, when point 70 compared with point 60, |t|=0.78＜2.086; |t|=2.09＞2.086 when compared with point 50.

According to the analysis, there is an obvious advantage when 60-70 entries are listed on every page, although users may spend a bit more time on searching target when 60 entries are shown on every page, the data points out that there is no significant difference between the two different modes. If entries number was bigger (or smaller) than 70 (or 60), retrieval efficiency would be reduced as the number rising (reducing). In conclusion, a number between 60 and 70 is an optimal number of list entries on every page.

USABILITY TEST ON BACKGROUND COLOR

EXPERIMENTAL DESIGN

High-fidelity model was also applied in this experiment, the test was organized with 5 reference groups, and the background color of respective group was designed to be “white”, “white-light”, “white-dark”, “white-dark” and “dark-dark”(Tab.3). Subjects were asked to pick up a certain item from each group, and the respective response time was recorded. After that, subject’s preference would be investigated by a following interview.

Tab. 3 Group Setting

group	interface	group	interface
White		Dark - Light	
White - Light		Dark - Dark	
White - Dark			

Testing sequence was disrupted to avoid its effects on data, and different searching targets were set for each group. All the tests were made on same equipment to eliminate systematic errors caused by different loading rate.

DATA ANALYSIS

Exclude the invalid data and get 11 groups data. In order to reduce individual differences, we calculated standardized data first (Tab.4).

Tab.4 Standardized data for test 2

	standardized data											**mean**
White	1.16	0.92	1.35	1.10	1.12	0.93	1.35	1.19	0.9	0.99	0.89	1.08
White-light	0.80	0.92	0.87	0.96	0.86	0.93	0.79	1.10	0.9	0.92	0.89	0.90
White-dark	0.71	1.02	1.35	0.82	0.78	0.86	0.71	1.10	1.1	1.06	1.16	0.97
Dark-light	1.27	1.22	0.67	1.03	0.95	1.14	0.87	0.93	1	1.06	1.07	1.02
Dark-dark	1.25	0.92	0.77	1.10	1.29	1.14	1.27	0.68	1.1	0.99	0.98	1.04

In tab.4 we can find that group “white-light” was the most efficient, so chose this group to compare with other ones.

When the group “white-light” compared with “white-dark”:

Suppose: H_0:ì$_1$-ì$_2$=0; H_1:ì$_1$-ì$_2$≠0, we can get t=$\frac{\overline{X1}-\overline{X2}}{\sqrt{\frac{S1^2}{n1}+\frac{S2^2}{n2}}}$ =-1.09

When significance levelá=0.05 , critical value of t distribution is 2.086, Since |t|=1.09＜2.086, the assumption is correct.

When group “white-light” compared with “dark-light”:

Suppose: H_0:ì$_1$-ì$_2$=0; H_1:ì$_1$-ì$_2$≠0, easy to get t=$\frac{\overline{X1}-\overline{X2}}{\sqrt{\frac{S1^2}{n1}+\frac{S2^2}{n2}}}$ =2.23

When significance level á=0.05, critical value of t distribution is 2.086, Since |t|=2.23＞2.086, the assumption is incorrect.

According to above analysis, it can be proved that group “white-light” is better than all other groups, but the advantage is not obvious when compared with group “white-dark”. We can draw such a conclusion: users generally have a color preference, which proved by “white-light” group works best, while the difference between similar colors are not obvious, but there is apparent advantage compared with other groups, and “white-light” is easier for users to read and brings them better experience.

CONCLUSION

The paper took usability testing method to study how list pages’ properties could influence user experience, and tried to get the most suitable list length and background color. There are two part of the test: usability test on list length and background color, through the whole experiment we get the following conclusion:

List length has a significant influence on the availability of list page

From the experiment we can know that entries number on each page has a significant influence on the availability of list page. Too many entries lead to bad visual experience so that users are becoming too depressed to find targets from a long list and then searching rate is reduced. On the other side, the list should not be too short either, since short list leads to large number of pages, frequent clicks not only increases the burden on the system, but also user's workload. Therefore, a reasonable threshold of entries number is necessary, which can both accord with users’ browsing habits and reduce the burden on the system.

This paper designed an availability test on this problem and got effective results. It shows that numbers between 60 and 70 are reasonable for each page, when numbers are beyond the range users’ retrieval efficiency keeps reducing.

Background color has a significant influence on the availability of list page

According to the availability test, background color has a significant influence on the availability of list page, both of basic color and adjacentlines’ color difference can influence identification of the list. It has been proved that the lighter basic color is, the easier list is to be identified; the smaller the adjacentlines’ color difference is, the easier list is to be identified. During the interviews, when being asked about color preference, 6 of 11 test users chose group “white-light”, besides users said, a single background leads to visual fatigue, but bigdifference of adjacentlines’ color leads to visual giddiness.

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