Empirical Study of the medium fidelity prototype

for

Deal Finder

Version 1.1

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Introduction

Purpose

The purpose of the document is to do an empirical study of the medium fidelity prototype we created for the project designed to aim at making the online shopping experience for the shopper easier by finding the optimum deals from various e-commerce websites for a given product type. It includes the conventions, research questions,determination of variables,choosing participants, designing experiments and Data Collection and Analysis.

Document Conventions

TERM	*EXPLANATIONS*
Aesthetic	A core design principle that defines a design's pleasing qualities
Objects	groups of similar things. e.g. text objects or image objects.
Interface	Here, a part of the software UI that is being used for testing various hypotheses

- **Framing Research Questions:**
  The aesthetics of an interface directly affects how pleasant the user feels while using it which in turn affects the usability of the website. In this study we have chosen to find factors on which aesthetics of an interface may depend on. The following factors have been decided on the basis of observations and availability of interfaces.

RQ1. How the aesthetic score(on scale 1-10) depends on the number of image objects ?
$H1_0$: Aesthetic score(on scale 1-10) does not depend on the number of image objects**.**
$H1_1$: Aesthetic score(on scale 1-10) does depend on the number of image objects.

RQ2. How does the aesthetic score(on scale 1-10) depend on the layout of the objects ?
$H2_0$: Aesthetic score(on scale 1-10) does not depend on the layout of the objects.
$H2_1$: Aesthetic score(on scale 1-10) does depend on the layout of the objects.

RQ3: How does aesthetic score(on scale 1-10) depend on the size of the image objects ?
$H3_0$: Aesthetic score(on scale 1-10) does not depend on the size of the image objects.
$H3_1$: Aesthetic score(on scale 1-10) does depend on the size of the image objects.

RQ4: How does aesthetic score(on scale 1-10) depend on the number of text objects ?
$H4_0$: Aesthetic score(on scale 1-10) does not depend on the number of text objects.
$H4_1$: Aesthetic score(on scale 1-10) does depend on the number of text objects.

- **Determination of variables:**

For RQ1: Independent variables: Number of image objects (**I)**
Dependent variables: Aesthetic score**(A)**

For RQ2: Independent variables: Layout **(L)**
Dependent variables: Aesthetic score**(A)**

For RQ3: Independent variables: Size of image objects **(S)**
Dependent variables: Aesthetic score**(A)**

For RQ4: Independent variables: Number of text objects**(T)**
Dependent variables: Aesthetic score**(A)**

Control variables:

Age: 20-23
Prior Knowledge of E-commerce websites: present
System Settings: The participants were instructed to use a laptop and increase their brightness to the maximum level.

Confounding Variables: Practice and Carry over effect

During the course of the experiment the participants may get used to the interfaces shown to them and this may tamper with the recording of data for our study. This is the practice effect. The observations of one experiment may affect the other as change in one of the independent variables may overlap with change in another independent variable. This is the carry-over effect. To minimize both of these we tried to randomize the order of interfaces shown to the user to the maximum extent.

- **Choosing Participants:**

The chosen study participants are 7 college students and 6 new software engineers working at various firms for around a year now. The participants were tested under the assumption that they were familiar with daily use of e-commerce websites and knew about generic interfaces used in those.

- **Experimental Design:**
  - **Subject Design:** There are two types of subject designs, within-subject and between-subject designs. We have employed- **Within-subject design :** All the values of the independent variables will be included in the rating task for all participants. They will be subjected to all different conditions for the best judgment on their part. The comparisons made will be between the different interfaces on the basis of values of the factors chosen in the research questions. The number of participants is 13 and interfaces are total 12. We can feasibly task all participants to rate all interfaces for their aesthetic score without spending much time.

  - **Test Conditions:**. The research questions and interfaces were chosen so that the dependence on the factors could be measured. The levels of these factors are decided on the basis of availability of interfaces and the different values observed. Varying the factors to get sophisticated results from our empirical study the test conditions are as follows:

    For RQ1: The aesthetic score (on a scale of 1-10) is recorded varying the number of image objects with the values - 1,3,7,9

    For RQ2: The aesthetic score (on a scale of 1-10) is recorded varying the layout of objects as - F-shaped layout, grid of boxes layout, fixed sidebar.

    For RQ3: The aesthetic score (on a scale of 1-10) is recorded varying the size of image objects as - Low,mid,maximum

    For RQ4: The aesthetic score (on a scale of 1-10) is recorded varying the number of text objects as - 3,5,8

  - **Task Assigned and Procedure of recording the data:**
    For each research question we select a group of interfaces with the required values as per the above test conditions and make sure we subject each participant to these in a random order. We use **Latin square method** to assign these tasks and make sure each interface involved in the study is assigned to each participant in the following order.

For RQ1:

interface	interface#1	interface#3	interface#10	interface#4
No. of Image Objects	1	3	7	9
Participant	**task1**	**task2**	**task3**	**task4**
P#1	interface#1	interface#3	interface#10	interface#4
P#2	interface#4	interface#1	interface#3	interface#10
P#3	interface#10	interface#1	interface#4	interface#3
P#4	interface#3	interface#10	interface#4	interface#1
P#5	interface#1	interface#3	interface#10	interface#4
P#6	interface#4	interface#1	interface#3	interface#10
P#7	interface#10	interface#1	interface#4	interface#3
P#8	interface#3	interface#10	interface#4	interface#1
P#9	interface#1	interface#3	interface#10	interface#4
P#10	interface#4	interface#1	interface#3	interface#10
P#11	interface#10	interface#1	interface#4	interface#3
P#12	interface#3	interface#10	interface#4	interface#1
P#13	interface#1	interface#3	interface#10	interface#4

For RQ2:

interface	interface#12	interface#6	interface#2
Layout	F layout	grid	fixed sidebar
Participant	**task1**	**task2**	**task3**
P#1	interface#12	interface#6	interface#2
P#2	interface#2	interface#12	interface#6
P#3	interface#6	interface#2	interface#12
P#4	interface#12	interface#6	interface#2
P#5	interface#2	interface#12	interface#6
P#6	interface#6	interface#2	interface#12
P#7	interface#12	interface#6	interface#2
P#8	interface#2	interface#12	interface#6
P#9	interface#6	interface#2	interface#12
P#10	interface#12	interface#6	interface#2
P#11	interface#2	interface#12	interface#6
P#12	interface#6	interface#2	interface#12
P#13	interface#12	interface#6	interface#2

For RQ3:

interface	interface#4	interface#11	interface#8
Size Of Image	Max	Less	Mid
Participant	task1	task2	task3
P#1	interface#4	interface#11	interface#8
P#2	interface#8	interface#4	interface#11
P#3	interface#11	interface#8	interface#4
P#4	interface#4	interface#11	interface#8
P#5	interface#8	interface#4	interface#11
P#6	interface#11	interface#8	interface#4
P#7	interface#4	interface#11	interface#8
P#8	interface#8	interface#4	interface#11
P#9	interface#11	interface#8	interface#4
P#10	interface#4	interface#11	interface#8
P#11	interface#8	interface#4	interface#11
P#12	interface#11	interface#8	interface#4
P#13	interface#4	interface#11	interface#8

For RQ4:

interface	interface#5	interface#7	interface#9
No Of Text Objects	5	8	3
Participant	task1	task2	task3
P#1	interface#1	interface#11	interface#8
P#2	interface#8	interface#1	interface#11
P#3	interface#11	interface#8	interface#1
P#4	interface#1	interface#11	interface#8
P#5	interface#8	interface#1	interface#11
P#6	interface#11	interface#8	interface#1
P#7	interface#1	interface#11	interface#8
P#8	interface#8	interface#1	interface#11
P#9	interface#11	interface#8	interface#1
P#10	interface#1	interface#11	interface#8
P#11	interface#8	interface#1	interface#11
P#12	interface#11	interface#8	interface#1
P#13	interface#1	interface#11	interface#8

❑ **Data collection:**

The interfaces were shown to the participants and the aesthetic score ratings(on a scale of 1-10) were recorded. Following is the data collected for each study.

RQ1:

Participant	interface#1	interface#3	interface#10	interface#4
P#1	9	8	8	10
P#2	9	8	8	10
P#3	8	7	9	10
P#4	7	6	10	10
P#5	8	7	7	10
P#6	9	3	6	9
P#7	7	8	7	10
P#8	7	5	3	9
P#9	7	3	7	5
P#10	8	7	4	8
P#11	8	7	7	8
P#12	8	9	4	8
P#13	8	7	3	9

RQ2:

Participant	interface#12	interface#6	interface#2
P#1	8	8	8
P#2	7	8	9
P#3	7	8	8
P#4	8	6	8
P#5	9	9	9
P#6	8	8	6
P#7	9	9	9
P#8	7	6	8
P#9	7	7	9
P#10	8	8	6
P#11	8	7	9
P#12	6	6	7
P#13	7	5	5

RQ3:

Participant	interface#4	interface#11	interface#8
P#1	10	9	8
P#2	10	10	10
P#3	10	8	8
P#4	10	10	10
P#5	10	9	9
P#6	9	7	8
P#7	10	10	9
P#8	9	4	4
P#9	5	7	5
P#10	8	8	9
P#11	8	8	7
P#12	8	7	3
P#13	9	7	8

RQ4:

Participant	interface#5	interface#7	interface#9
P#1	8	7	8
P#2	9	9	9
P#3	9	7	7
P#4	8	5	7
P#5	9	8	7
P#6	9	8	5
P#7	8	8	8
P#8	4	2	5
P#9	8	3	3
P#10	7	8	3
P#11	5	4	5
P#12	6	3	4
P#13	9	8	5

- **Data Analysis:**

The data was collected with a within-subject design with three or more levels for each independent variable thus we use the **non parametric**- **Friedman Test of significance** to calculate the statistical significance of the data and try and refute the null hypothesis of each research question. We have used a pre-specified significance level **α = 0.05**. The online resource :friedman calculator was used for the following calculations.

RQ1:

The $\chi^2(r)$ statistic is 17.8846 (3, N = 13).
The degree of freedom is 4.
The p-value is 0.00046.
The result is statistically significant as $p < 0.05$.

RQ2:

The $\chi^2(r)$ statistic is 1.6538 (2, N = 13).
The degree of freedom is 3.
The p-value is 0.43739.
The result is not statistically significant as $p > 0.05$.

RQ3:

The $\chi^2(r)$ statistic is 6 (2, N = 13).
The degree of freedom is 3.
The p-value is 0.04979.
The result is statistically significant as $p < 0.05$.

RQ4:

The $\chi^2(r)$ statistic is 7.5385 (2, N = 13).
The degree of freedom is 3.
The p-value is 0.02307.
The result is statistically significant as $p < 0.05$.

- **Conclusion:**

  As per the friedman test of the data we can conclude the following hypotheses.

$H1_1$: Aesthetic score(on scale 1-10) **does depend** on the number of image objects.
$H2_0$: Aesthetic score(on scale 1-10) **does not depend** on the layout of the objects.
$H3_1$: Aesthetic score(on scale 1-10) **does depend** on the size of the image objects.
$H4_1$: Aesthetic score(on scale 1-10) **does depend** on the number of text objects

From the above analysis of the data, dependence of aesthetic score on number of image objects has more than 99%, on size of image objects has more than 95% and on number of text objects has more than 97% likelihood to be true and not occurred randomly. Whereas layout of objects has a p-value of 0.437 which suggests that there is very weak evidence to refute our existing null hypothesis. Therefore, considering pre-specified significance level **$\alpha = 0.05$,** we can conclude that the aesthetic value of an interface **depends on the number of image objects, size of image objects and number of test objects** but it **does not depend on the layout of the interface** . This conclusion is valid for the pre-decided set of control variables. This result may have arrived due to the influence of confounding variables as well.