EMOTIONAL INTERFACE METHODOLOGY

Sylvia Tzvetanova[1]

[1]School of Design, Core A, The Hong Kong Polytechnic University, Hung Hom, Hong Kong, sdsylvia@polyu.edu.hk

ABSTRACT:

This paper presents an overview of a research methodology on emotional interfaces and the results of the final stage of this research. The stages of the research undertaken are: exploration of the theories of emotion in the psychological science, modeling of the emotional concerns about interfaces, emotional interface demonstration and implementation of the model and emotional interface evaluation. In the second part of the paper, the results of the final stage i.e. the emotional interface evaluation, is presented. The evaluation shows the user's emotional responses towards interfaces.

Keywords: Design and emotion, interaction, adaptive interfaces

1. INTRODUCTION

Studies in psychology have shown the importance of emotions in human life. Emotions are essential in everyday life as core factors in rational decision making, intelligence, and memory.

There exists a body of research literature on emotion design, which provides a basis for emotion – oriented computers from a technical perspective (Picard 1997). The industry has developed emotion recognition tools and techniques using physical sensing to detect the user's emotions (Picard and Healey 1997, Burleson and Picard 2004). While the technology has made attempts to implement emotion recognition and processing in interfaces, its focus does not provide a sufficient basis for modeling emotional appraisal and supporting the user emotionally. The technological foundation of affective computing, such as the different tools and databases, makes it possible to develop applications in this field. The literature also shows that research on design approaches to modeling emotion in HCI has not been conducted. In large part design research has focused on usability issues in HCI, disregarding the role of emotions. In addition, those concerned about emotions in interfaces have largely been computer specialists, who do not consider the aesthetic approach relevant. The approaches to implementing emotions in interfaces are largely computational and no research has been conducted on the emotions aroused in the interaction process between the machine and the user. The hypothesis of this research is that the user might have emotion toward an interface ways of interaction, its colors, its images, or its content. Furthermore, as a natural shift in focus from usability to emotions in interfaces, the HCI approach can be taken advantage of to create models of emotional interfaces that operate to improve user performance.

1. 1. SCOPE OF RESEARCH

The goal of this research is to formulate an emotional interface design in the field of HCI in an Asian context. For this purpose the objectives of the research are to develop a methodology and a demonstration of an emotional interface.

This research is based on the belief that machines and objects in general, can be considered as having their own emotional language (Ortony et al. 1988, Picard 1997, Desmet 2002 and Norman 2004). An important research topic is adaptive interfaces which change themselves dynamically to adapt their functions and their interaction in order to support the user's way of thinking. The

concept was inspired by the possibility of creating an adaptive interface to respond to the user's emotions from the perspective of aesthetics, where the user is involved naturally. An adaptive interface is the one that is tailored in appearance in order to support emotionally the user through responding with empathy to the user's emotion detected. This involves how people assume emotions and copy them from other people just by reading their body language and facial expression. In addition, subjective factors such as good weather, morning time, and a beautiful view can improve the observer's mood. Our goals are to model a design tool for emotions in interfaces. The HUMAINE (Human-Machine Interaction Network on Emotion) organization for exploring the possibilities for defining standards in emotion-oriented computing suggests that the key parts of a strategy for emotion-oriented computing are: on the one hand the knowledge of emotions - psychology of emotional processes and creating a database of raw empirical data - and from the other side application-oriented research on emotion related language for computers and the usability/evaluation of emotion-oriented computing (Aylett, Schroeder and Cowie 2005). The core technologies suggested by HUMAINE are emotion detection, synthesis of signs, and planning action.

2. DESIGN METHODOLOGY

There are three main questions in relation to the goals of the research on emotional interface:

' Which cognitive mechanisms studied in previous research on emotion are relevant to emotional appraisal in interfaces?

' What are the factors in interfaces that influence the user's emotions?

' How can emotion be modeled in online graphic interfaces?

An appropriate theory of emotions is essential for understanding emotional synthesis mechanisms. It is important to study the emotional states that are relevant to emotion-oriented computing, as well as defining practical methods for describing these emotional states. Emotion modeling requires a terminological clarification of affect related terms such as "emotion", "mood", "sensuality", and "affective subjective experience". A core design question is integrating a theory of psychology into a design model. The cognitive theory is to be represented in a computational model, where the cause and effect of emotions are translated to interaction rules for an interface.

The adaptation of an interface is a demonstration of an emotional mechanism based on emotional appraisal. It has the purpose of visualizing and showing an example of the design model of emotional appraisal. Implementation is necessary to demonstrate the possibility of modeling emotional appraisal in interfaces, and to provide a basis for further evaluation. To support further this argument, it was reported that prototyping in design is an effective tool for innovation (Schrage 1999).

To approach the complex task of defining, modeling and designing an emotionally adaptive system, that supports emotionally the users it was developed a research plan was developed. The research on the emotional interfaces was divided into several parts. First, a work plan based on the needs of the project was developed. Research on emotions in interfaces can be subjective, and a scientific approach was taken. Only largely agreed upon theories of emotions were selected to be adapted for use in this research.

The work includes three stages adopted for the purposes of this study, as shown in Fig. 1. In the diagram, the research questions on the right hand side are supported by an appropriate methodology as shown on the left hand side, while in the middle are shown the expected outcomes. In the diagram, back arrows show the process is not only from top to bottom; when there is a need, the research may loop and repeat the previous stages. Those stages need to be performed chronologically in the process of defining an emotional interface. **First,** the identification of emotion eliciting conditions is necessary for the theoretical foundation of the research. Psychology has explained human cognition in relation to emotions, and this research can be used to better understand emotional interaction with interfaces. For the construction of an emotional interface it is appropriate to borrow a suitably large, agreed upon theory, which can be adapted for design purposes. **Second,** qualitative research with design experts is proposed to identify the way the psychology theory can be modeled. In particular this study aims to define new variables of emotion factors in interfaces that have subjective characteristics. Implicit knowledge of the design of emotions is addressed. Qualitative research was chosen as a methodology for gathering data on emotional appraisal in interfaces because such a tool is effective when the outcomes of research are not clear. Also qualitative research is used when rich information is required very often to handle the implicit knowledge of a topic. **Third,** the findings from the qualitative research are implemented in a sample case study demonstration to visualize the model of emotional interface. The implementation is a basis for evaluation of the validity of the model. The demonstration explores the possibilities of the model in a real system, which helps the researcher to explore the technological issues of the model. **Finally,** for validate the results of the

model and further explore the findings, quantitative research is selected for the evaluation of the implementation. This exploration is conducted to show statistical representations of the emotional preference of the users. The form of the research is an online questionnaire in order to gather the user's responses to the emotional interface. These kinds of questionnaires are often used in usability testing to explore a hypothesis on a preferred interaction. In the following sections of this paper the final exploration stage, i.e. the evaluation of the emotional model, will be presented.

Interactive methodology is a cyclical process of prototyping, testing, analyzing, and refining design work (Laurel 2003). In this way the project is developed with dialogs between the researcher, the audience, and the product's features. The knowledge of the desirable features is refined by improving again and again the prototype based on the feedback of the audience. In interaction design, it is not necessary for a final prototype to be developed. Instead a scenario or only one mechanism can be tested, often as a paper prototype to identify the optimal interaction process. The exploration of implementation is important in that the audience gives direct feedback about their impression of the artifact, especially when exploring emotional appraisal, as it is necessary to demonstrate the objective of the research.

In the following parts will present the final stage of this project: the evaluation of an emotional interface and the results of this evaluation will be discussed.
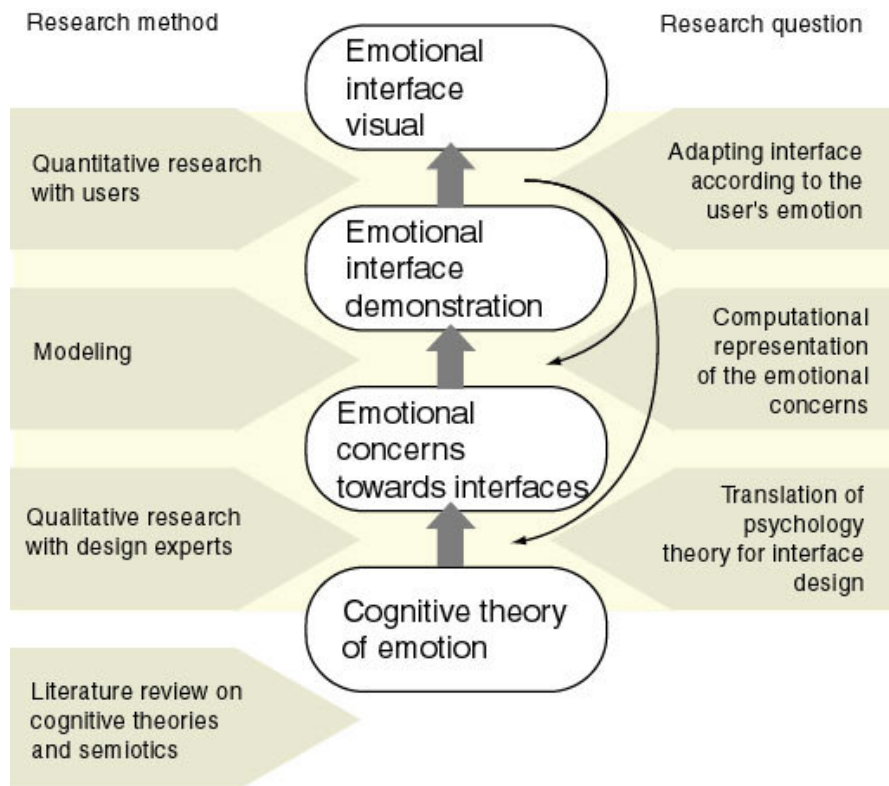
Figure 1. An approach to the research questions

3. EVALUATION

Below will be presented the final stage of this study as described in the section earlier, consisting of an evaluation of an emotional interface. Evaluation of the approach to emotion design implemented in the demonstration is a difficult issue, since emotion is in itself a psychological construct, which is difficult to measure. In this work emotion sets are identified for test rating and these sets are used in a questionnaire for users to compare the existing interfaces with an emotional interface.

Although the demonstration is developed with a methodology based on qualitative research, the quantitative research in this study is necessary to identify the users' preferences. The major advantage of this study is the direct involvement of the users and the large number of respondents. Comparison with the values inferred by the modeled emotional interface gave the researcher a chance to evaluate the users' preferences.

This study is designed to explore the hypothesis of the validity of the model of design of emotions. It explored:

- ' personal characteristics vs. emotion in interfaces,

- ' adapted vs. plain interface.

3.1. ONLINE QUESTIONNAIRE AND SUBJECTS

An online questionnaire was distributed to the targeted users in Asia Pacific. No payment was offered to the subjects. A lucky draw for a small award was announced: at the end of the survey a small award could be drawn by one of the participants.

The targeted users were young people aged 20 to 30 years mainly from Hong Kong. Asian users were selected because different cultures may respond with different emotions for a given interface. Attitudes can influence cognition, in particular emotional appraisal, which depends on one's perception of the outside world in relation to one's goals and preferences. The cultural dependence of emotional appraisal has not been widely discussed; however, there is evidence of differences between cultures in relation to affect eliciting conditions (Markus and Kitayama 1991). In this research, differences are not sought; rather to avoid confusion in the results the research is applied in the Asian context.

3. 2. EVALUATED INTERFACES

In the survey two online storytelling interfaces were compared. The stories originated from ethnic minorities in China and are of similar length. The first interface was a usable interface, which had no images (NADI - non adapted interface) (see Fig. 2), was plain with a white background and black typeface, and was easy to navigate. Furthermore this interface was designed according to the usability rules suggested by Nielsen (1999).

The second interface evaluated in the online survey was an emotionally adapted interface (ADI - adapted interface) (see Fig. 3). The interface differed from the plain NADI by having images and animation, activated automatically if the user showrd negative emotion.

Two different stories were chosen so that each user would evaluate the two different interfaces, and the personality factor would not impact on the comparison. The hypothesis was that the users would engage more actively with the ADI and respond to it with positive emotion. For this purpose the participants were asked to report on their emotion toward the two interfaces to find out whether the adaptive mechanism was able to trigger positive emotion.

Figure 2: Visual of the screenshots' flow of NADI. The user browse trough the text content pages ,
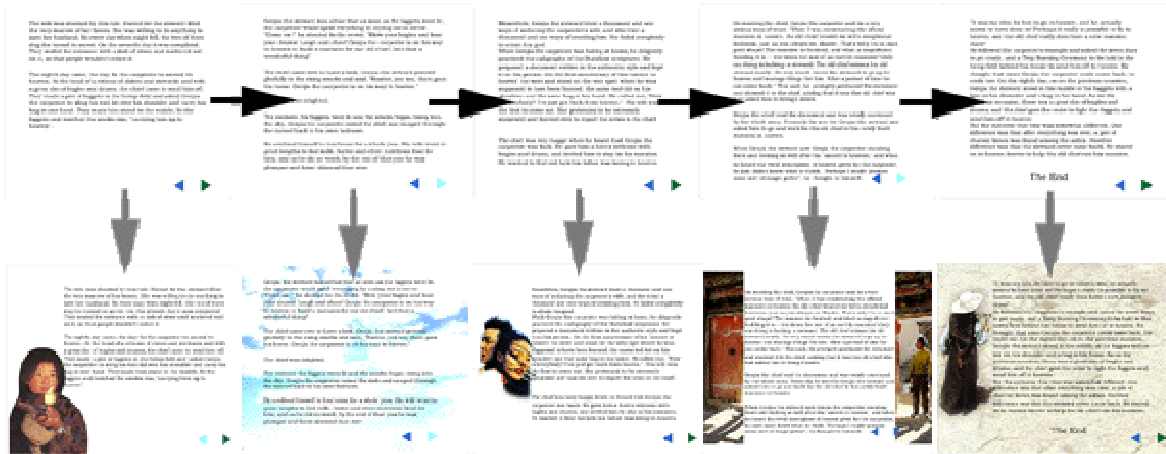
Figure 3: Visual of the screenshots' flow of ADI. The user browse trough the text content pages (on the top) and if the user shows dissatisfaction the systems switches to the images mode (on the bottom).

3. 3. EMOTIONAL SETS FOR EVALUATION OF AN INTERFACE

The set of basic emotions is largely discussed and it is not defined. Kort, Reilly and Picard (2001) constructed a scale of emotions related to learning ranging from negative to positive states (from 0 to +4), see Table 1. The basic sets suggested by Kort et al. are: anxiety-confidence, boredom-fascination, frustration-euphoria, dispirited-encouraged, and terror-enchantment. Based on these basic sets, an assumption was made about the possible emotions involved in interacting with web based systems, see Table 1. The online survey used this set of basic emotions, adapted from the

basic sets suggested by Kort et al. The emotions are rated between -2 and 2 and centered at 0. Negative emotions were had negative values and positive emotions had positive values.

	RATING				
TYPE	2	1	0	-1	-2
Content	Enthusiastic	Excellent	Satisfactory	Not Satisfactory	Disappointment
Educational	Fascination	Captivation	Interest	No Interest	Boredom
Appearance	Joy	Enjoyment/ Pleasure	Indifference	Repulse	Distress
Organization	Confident	Hope	Comfort	Uncomforted	Fear

Table 1: Rated emotion sets for evaluation purposes.

3. 4. ONLINE QUESTIONNAIRE SETTING

The survey consisted of 23 questions, with 5 general questions about the personal details of the participants and 9 questions about their emotional response to each story. This first group of questions from collected information about the personality and preferences of the participants, and was included to indentify the personal reasons of the users for their emotion. According to the OCC model (Ortony, Clore and Collince 1988), emotional appraisal depends on people's personal characteristics and concerns. The variables chosen for observation in this introductory group of questions of the survey were:

' gender - according to the OutSite factors model described earlier, and based on the literature review, emotional appraisal depends on the subject's gender;

' motivation - this variable was chosen for observation to verify the importance of motivation in emotional appraisal of interfaces. Earlier in the quantitative research the importance of the usefulness of the interface's information/content was noted;

' personality - this variable was chosen to identify the relation of the OutSite Factors model in general to the emotional appraisal of interfaces.

The second and third groups of questions were respectively about the first and the second interfaces. The same 9 questions each were asked about each of the two stories. These questions were for identifying the emotional responses to the two stories and to compare the InSite factors related to them. The variables observed were appearance and organization. Additionally, the users were asked to report on their feelings in general toward the two interfaces

using the graded scale of emotions (see Table 1). The rated emotion sets were: enthusiastic - disappointing, fascinating - boring, happy - distressing, and confident - scary. The question set was a comprehensive scale of graded emotions. The users could easily understand that each of the emotion sets varied from positive toward negative. The questionnaire also requested the subjects to comment on their emotional impressions in their own words.

Specifically, there were two questions addressing particular elements in each of the interfaces. The participants could comment in their own words on their impressions of the design elements of the interfaces. This allowed the author to gather richer data and explore the participants' personal impressions. The questions for the first story addressed the typeface and the animation in the interface. The subjects were shown the image and the animation and were asked the following questions regarding the typeface and the animation:

What Emotion you had toward the typeface of the story? Do you feel something about it?

Did you have any emotional response for the animation, for example maybe you like it? It annoys you? Please explain: _____

3. 5. TIME RECORDER

Additionally, the time spent on each page of the two stories was recorded. A timer was set on each page to return the user's time spent on the page, the time of the day, and the total time needed to read through each story. As described earlier in the OutSite factors model, some of the emotion mechanisms were based on the research findings of Beck (2005) on time response and its relation to emotion. The timer used in the survey was set to identify whether the implemented model of timing in the emotional interface tested showed a relationship to the user's emotion, and if the timer had a positive influence on the user's emotions. The values of the time were returned on each subject for comparison with their emotional responses in the survey questionnaire. The time recorder used an action script communicating with a PHP script to return the values of the time and send them to an e-mail address for data recording.

4. RESULTS

A total of 63 people took part in the survey, including 32 males, 28 females and 3 people whose gender was unknown. The data collected was from the Asia Pacific region. Most of these people were from Hong Kong in particular. In general the participants reported that they were interested to read the two stories. A small number were not interested in the stories themselves, but were intrigued by the questionnaire.

The results were evaluated with an analysis of variance (ANOVA) statistical approach. Most researchers, in particular in the field of HCI, choose the ANOVA approach to their usability evaluation of multiple mixed variables (Park, Harada and Igarashi 2006). The results were calculated with the SPSS software. This software is used largely for academic purposes and in particular it is commonly used as a statistic tool in the Hong Kong Polytechnic University.

4. 1. USER FACTORS IN RELATION TO EMOTIONAL APPRAISAL IN INTERFACES

In the survey several variables related to the user factors were observed to see to what extent these variables influence the emotional appraisal. What was observed included the influence of gender on the emotional preferences of the participants, and the influence of their personality on their emotional responses. The other variable observed was the factor of motivation: if the participant found the online stories useful or not before reading the two stories and what their emotional response was after they read the two stories.

Gender

In general, gender is not related to any significant difference in affective responses in the survey. However, the females responded with slightly more positive emotion on design, overall impression, and interface categories compared to the males, who responded more positively than the females on organization, presentation, and usability. The gender distribution is shown in Fig. 4 and the difference in response between the two genders is shown in Fig. 5.

The percentage results show that the men were more likely to grade the two stories around neutral emotion compared to the women who were more likely to show higher arousal of emotion. In discussion about these results with Asian users, they commented that "Men will let women

choose regarding aesthetics because men do not have an opinion". As far as the experiment indicates, in an Asian context, women express higher arousal and have more emotional concerns than men.

Your gender is:		Response Percent	Response Total
Male		53.3%	32
Female		46.7%	28

Sum	Min	Max	Mean
4	-1	1	0.1

Total # of respondents **63**.   Statistics based on **60** respondents   **0** filtered;   3 skipped.

Figure 4: Chart of the female and male participants.
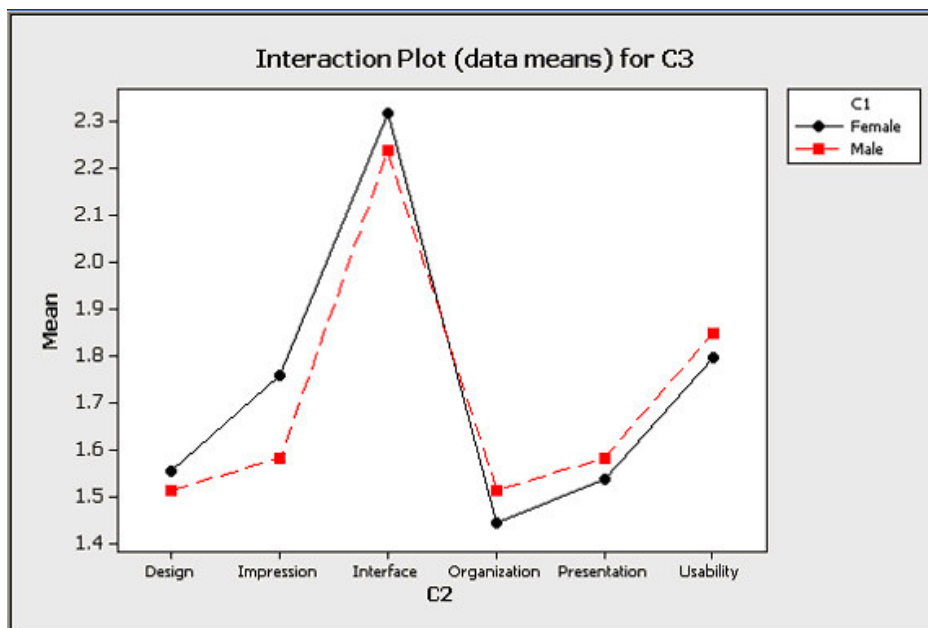
Figure 5: A graph of the gender differences in relation to emotional responses to the two interfaces.

Motivation

Among the respondents to the survey, 53.7% thought that the online stories were useful, 25% thought that they were not and 12.3% did not have an opinion. Those who reported to have more motivation to read the storyes also responded with slightly more positive emotions to most of the observed categories of the interfaces. See Figures 6 and 7.

Do you find online stories useful?		Response Percent	Response Total
Yes		56.7%	34
No		25%	15
Indifferent		18.3%	11

Sum	Min	Max	Mean
19	-1	1	0.3

Total # of respondents **63**.　Statistics based on **60** respondents　**0** filtered;　3 skipped.

Figure 6: Chart of the female and male participants.
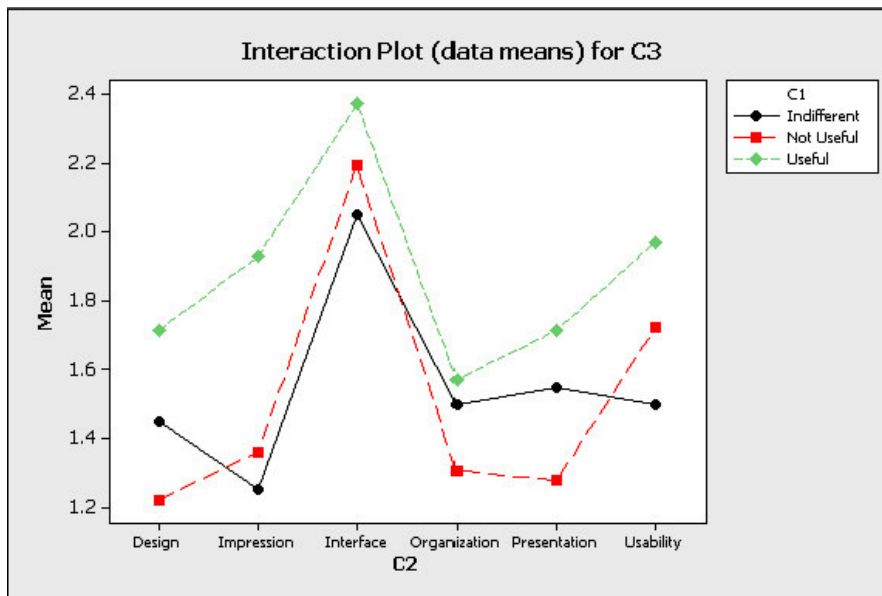
Figure 7: A graph of the gender differences in relation to emotional responses to the two interfaces.

Personality

The personality variable did not show any significant relation to the emotional responses to the two interfaces tested. For some of the observed elements of the ADI and the NADI, the unhappy group reported more positive emotions than the group that was happy with the organization, presentation, and usability factors. The responses are shown in Figures 8 and 9.

13

Your personality is more:		Response Percent	Response Total
Cheerfoul, open to people		34.4%	21
Happy		49.2%	30
Not Happy		6.6%	4
No answer		9.8%	6

Sum	Min	Max	Mean	Standard deviation
68	-1	2	1.1	0.8

Total # of respondents 63.   Statistics based on 61 respondents   0 filtered;   2 skipped.
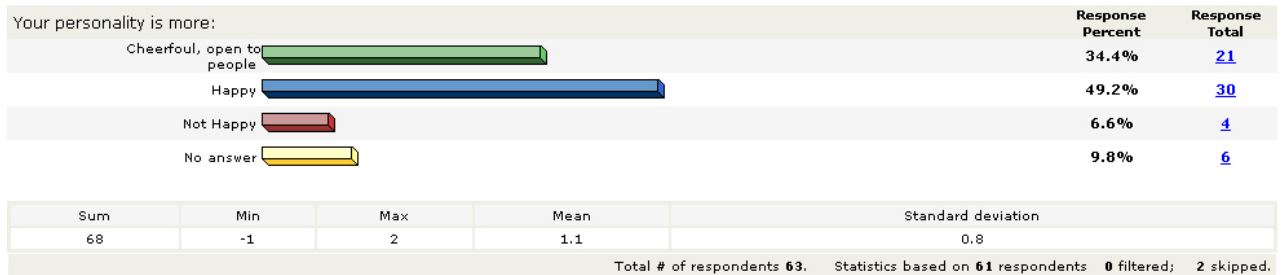
Figure 8: An overall responses for personality.
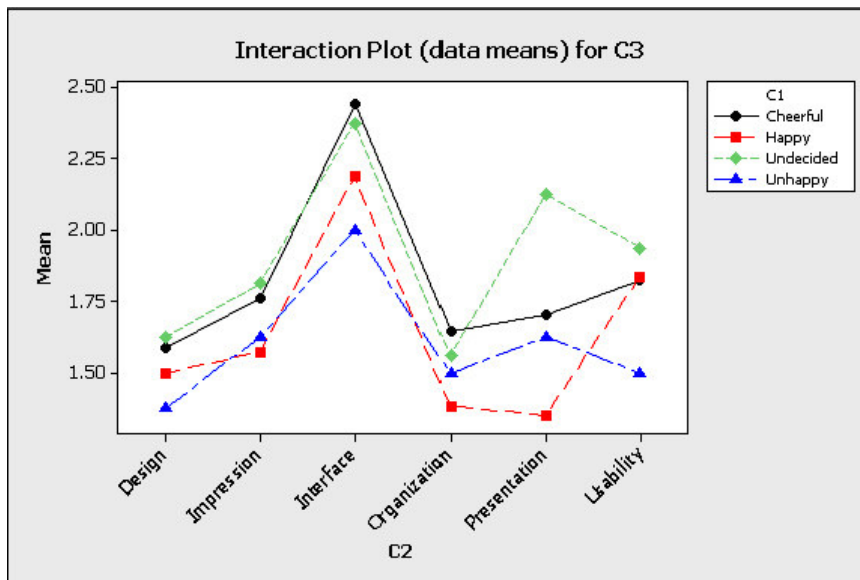
Figure 9: A graph of the personality factor differences in relation to emotional responses to the two interfaces.

4. 2. DESIGN FACTORS

The adaptive interface was evaluated by the users, who were asked to read through the story and compare it with a storytelling interface that did not have the adaptive mechanism. The interface was more plain and easier to use. The survey showed both stories were easy to use. There were no usability issues or unclear functions.

ANOVA analysis was conducted to explore the ratings of the two stories. The participants were driven by curiosity to fill in the questionnaire: 'First of all, I had not intended to read the story and I actually did not read it. But I would like to know what will happen to each paper. They seem more interesting than the story!' – one of them responded. The participants were asked to read through the two stories, which are very similar, coming from ethnic minorities in China. However, on the

question about the content nearly one quarter of the people responded that the ADI was fascinating and captivating. The ADI evoked more positive emotion than the non-adapted story the NADI. Most of the users reported that the ADI was more interesting than the NADI, even though the emotional loading of the two stories was similar. Some of the people gave their personal impressions in their own words: the people commented that the animation of the NADI was boring 4 people reported that they liked it as 'The animation of the word can make the description of the story more active', and 3 people referred to the animation as boring. Another function of the animation was that it drove the attention on a particular part of the story. Six people in their comments mentioned the relationship between the animated parts of the interface and attention, and at the same time they did not find the NADI interface elements emotionally positive: 'Doesn't affected so much. The story was boring when reading in text form...nothing can help!'. The typeface of the NADI got slightly more positive feedback than the animated elements: 'elegant', 'elegant modern and fashion', 'light, go upward'. It was described as: 'it seems to let me feel peace', 'it is easy to read, but it is boring', 'it is black and white comfortable to read'.

The images from the ADI were commented on as well. Thirty-four people commented on the love story image of two famous actors in a love scene. The most common association, made by 5 people, was that this was a sad image of love. Others replied positively, with desire about the image content: 'the image could be more animated, show how they hug, and kiss, would be even more emotional', 'I get emotion for these actors, celebrities make me interested, and they are beautiful to look at'. The other images in the ADI commented on in the survey, the participants described as peaceful: 'good, make me feel peace, refresh'.

Overall, the users brought up some of the same ideas that came up in the interviews with designers at the previous stage of this research (Tzvetanova, Tang and Justice 2006). For instance, it was pointed out that the content itself arouses emotion and it is more important than the appearance: 'my emotion is come from the story, the meaning of the words, not the graphic or animation, because the association between the visual and the story is not strong enough'. On average the people reported that they preferred the ADI because of the images and the dynamics: 'With more images, the second story is more attractive to me'. However, some other users expressed preferences for the simplified version: 'The first story was easy and simple and easy to read and the second story was complicated and difficult to relate and comprehend easily'.

On the whole, the ADI got more positive evaluation in emotional appearance than the NADI. The people were more likely to comment in one way or another the ADI was emotionally arousing, compared to the NADI, which was reported as good in terms of its usability factors (See Fig. 10).
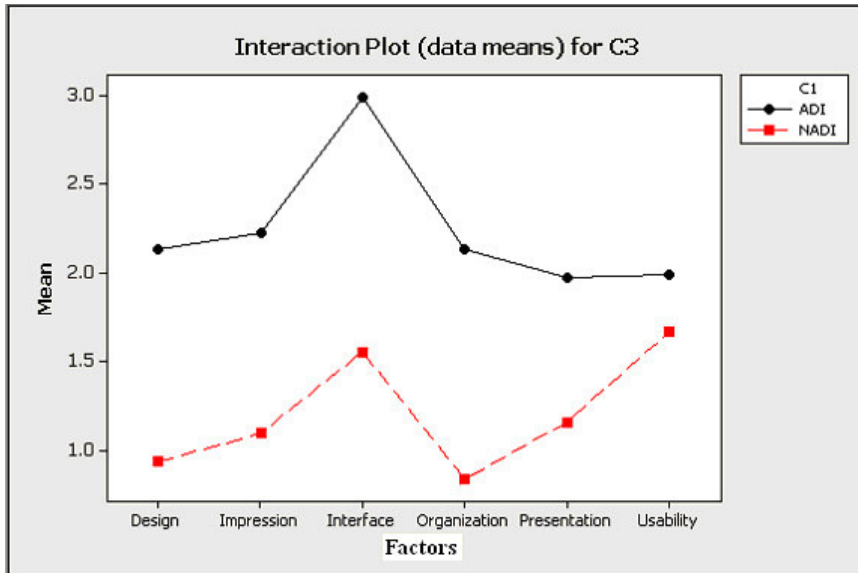
Figure 10: Overall graph showing the differences in the responses between NADI and ADI.

Presentation of the interface

The results show that the presentation was graded with a big difference in emotional response between the two stories (see Figures 11 and 12). The significance of the results show that the ADI presentation was more positively rated as *satisfactory to excellent* compared to the NADI, which was reported to be *satisfactory* to *unsatisfactory*.

Do you think the first story was satisfactory presented? Among these emotions which one is the closest?	Response Percent	Response Total
Enthusiastic	0%	0
Excellent	3.8%	2
Satisfactory	50.9%	27
Unsatisfactory	34%	18
Dissapointing	11.3%	6

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
-28	44	-2	1	-0.5	0.7	0

Total # of respondents 63.   Statistics based on 53 respondents   0 filtered;   10 skipped.

Figure 11: Presentation of the interface InSite factor responses analysis for NADI.

16

Do you think the second story was satisfactory presented? Among these emotions which one is the closest?		Response Percent	Response Total
Enthusiastic		15.7%	8
Excellent		15.7%	8
Satisfactory		47.1%	24
Unsatisfactury		13.7%	7
Dissapointing		7.8%	4

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
9	63	-2	2	0.2	1.1	0

Total # of respondents **63**.   Statistics based on **51** respondents   **0** filtered;   **12** skipped.

Figure 12: Presentation of the interface InSite factor responses analysis for ADI.

First impression of the interface

The participants first impression of the ADI was emotional than that of the NADI, with 39.6% of the participants rating the NADI as not interesting compared to the 37.3% who answered the same question on the ADI rating it as *interesting* (see Figures 13 and 14).

Do you think that the interface presenting the story about the The Magic Moneybag was fasinating? Among these emotions which is the closest?		Response Percent	Response Total
Fascinating		0%	0
Captivating		3.8%	2
Interesting		34%	18
Not Interesting		39.6%	21
Boring		22.6%	12

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
-43	71	-2	1	-0.8	0.8	-1

Total # of respondents **63**.   Statistics based on **53** respondents   **0** filtered;   **10** skipped.

Figure 13: First impression of the interface InSite factor analysis for NADI.

Do you think that the interface presenting the story about the The Three Gengias was fasinating? Among these emotions which one is the closest?		Response Percent	Response Total
Fascinating		19.6%	10
Captivating		17.6%	9
Interesting		37.3%	19
Not Interesting		19.6%	10
Boring		5.9%	3

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
13	71	-2	2	0.3	1.2	0

Total # of respondents **63**.   Statistics based on **51** respondents   **0** filtered;   **12** skipped.

Figure 14: First impression of the interface InSite factor analysis for ADI.

Overall happy vs. unhappy interface

The participants had almost the same emotional response to the ADI as the NADI overall. 50.9% of the participants rated the NADI as satisfactorily presented and 47.1% rated the ADI thought

story as satisfactorily presented (see Figures 15 and 16). However, comparing the means of the results, the ADI had the positive value of emotion of 0.8 compared to the negative value of emotion of – 0.3 for the NADI.

Do you think the interface of the The Magic Moneybag story makes you happy? Among these emotions which is the closest?	Response Percent	Response Total
Happy	5.8%	3
Enjoyable	7.7%	4
Indifferent	44.2%	23
Distressing	34.6%	18
Repulsive	7.7%	4

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
-16	50	-2	2	-0.3	0.9	0

Total # of respondents **63**.   Statistics based on **52** respondents   **0** filtered;   **11** skipped.

Figure 15: Overall happy vs. unhappy interface InSite factor analysis for ADI.

Do you think the interface of the The Three Gengias story makes you happy? Among these emotions which one is the closest?	Response Percent	Response Total
Happy	26%	13
Enjoyable	32%	16
Indifferent	38%	19
Distressing	2%	1
Repulsive	2%	1

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
39	73	-2	2	0.8	0.9	1

Total # of respondents **63**.   Statistics based on **50** respondents   **0** filtered;   **13** skipped.
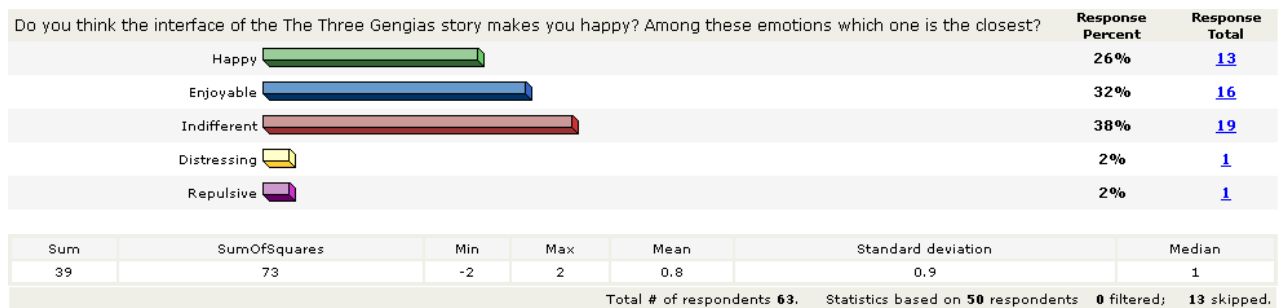
Figure 16: Overall happy vs. unhappy interface InSite factor analysis for ADI.

Usability of the interface

It was expected that the users would rate the NADI interface as more user friendly, because it is straight forward and based on usability rules with, in particular, easy navigation and readable black text on white background, as previously suggested (Dix 1998, Nielsen 1999). However, the participants rated the usability of the NADI as *comfortable* to *uncomfortable* compared to the ADI, which was rated more towards *comfortable* (see Figures 17 and 18).

Do you think the interface of The Magic Moneybag folk story makes you comfortable to read it? Among these emotions which is the closest?	Response Percent	Response Total
Confident	3.8%	2
Hopeful	7.5%	4
Comfortable	54.7%	29
Uncomfortable	34%	18
Scary	0%	0

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
-10	30	-1	2	-0.2	0.7	0

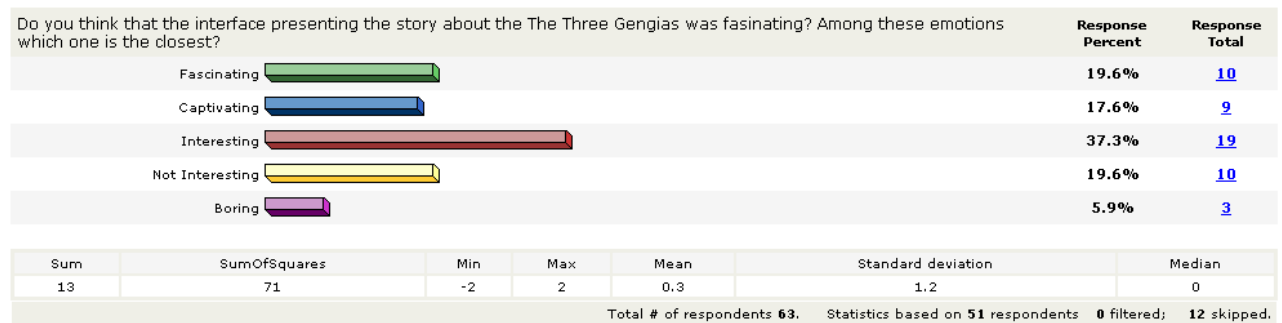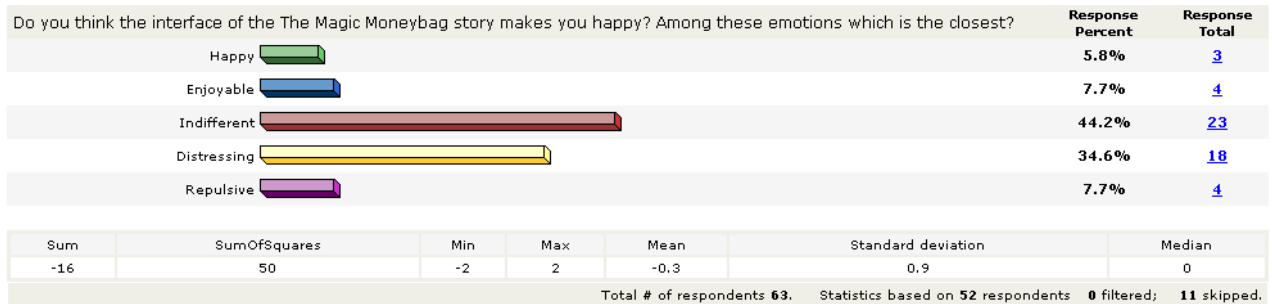Total # of respondents **63**.   Statistics based on **53** respondents   **0** filtered;   **10** skipped.

Figure 17: Usability of the interface InSite factor analysis for ADI.

Does the interface of the tree Gengias folk story makes you comfortable to read it? Among these emotions which is the closest?	Response Percent	Response Total
Confident	5.9%	3
Hopeful	19.6%	10
Comfortable	45.1%	23
Uncomfortable	27.5%	14
Scary	2%	1

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
0	40	-2	2	0	0.9	0

Total # of respondents **63**. Statistics based on **51** respondents **0** filtered; **12** skipped.
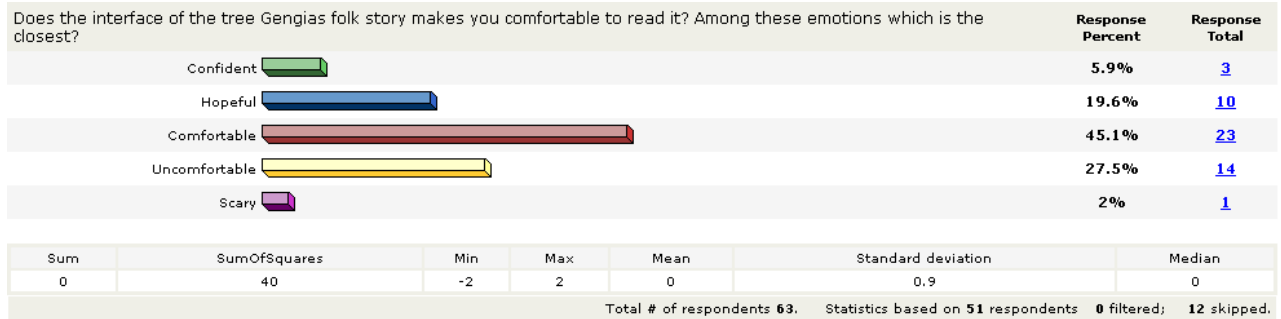
Figure 18: Usability of the interface InSite factor analysis for ADI.

Design of the interface

The participants had more positive emotional response to the ADI design than the NADI design (see Figures 19 and 20). Overall, the ADI was rated as *interesting* to *captivating* on the emotional scale compare to the NADI, which was rated as *not interesting*.
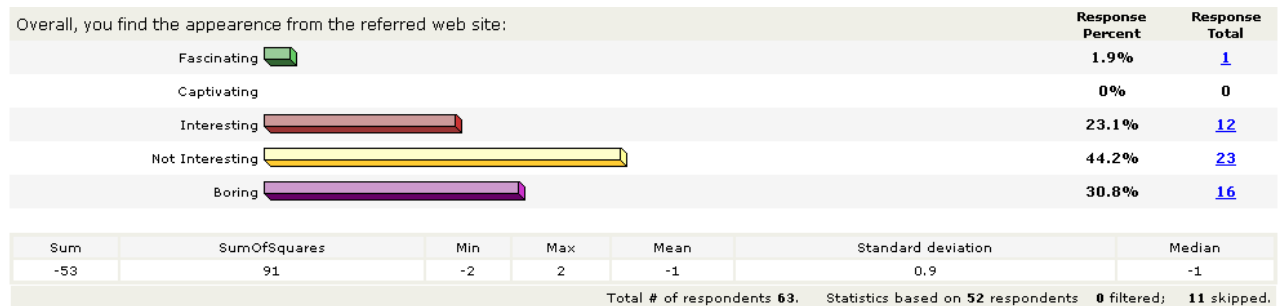
Overall, you find the appearence from the referred web site:	Response Percent	Response Total
Fascinating	1.9%	1
Captivating	0%	0
Interesting	23.1%	12
Not Interesting	44.2%	23
Boring	30.8%	16

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
-53	91	-2	2	-1	0.9	-1

Total # of respondents **63**. Statistics based on **52** respondents **0** filtered; **11** skipped.

Figure 19: Design of the interface InSite factor analysis for NADI.

Overall, you find the images from the referred web site:	Response Percent	Response Total
Fascinating	15.4%	8
Captivating	23.1%	12
Interesting	26.9%	14
Not Interesting	26.9%	14
Boring	7.7%	4

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
6	74	-2	2	0.1	1.2	0

Total # of respondents **63**. Statistics based on **52** respondents **0** filtered; **11** skipped.
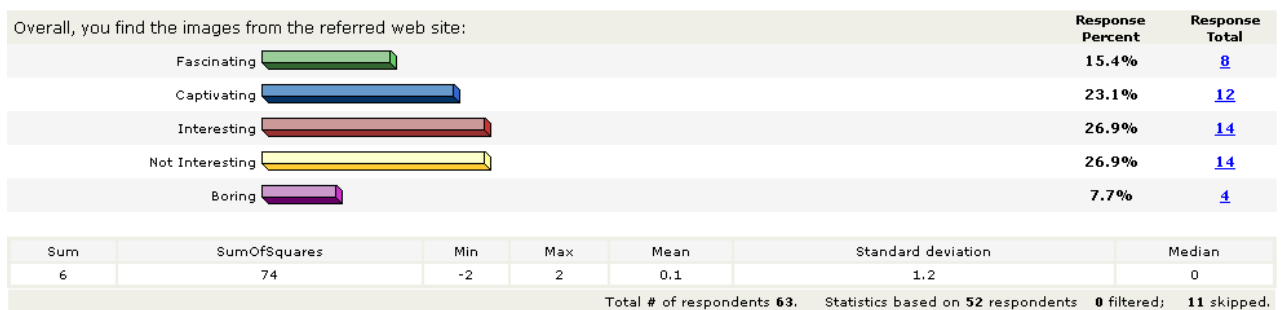
Figure 20: Design of the interface InSite factor analysis for ADI.

Organization of the interface

The participants had more positive emotional response to the ADI organization than the NADI organization (see Figures 21 and 22).
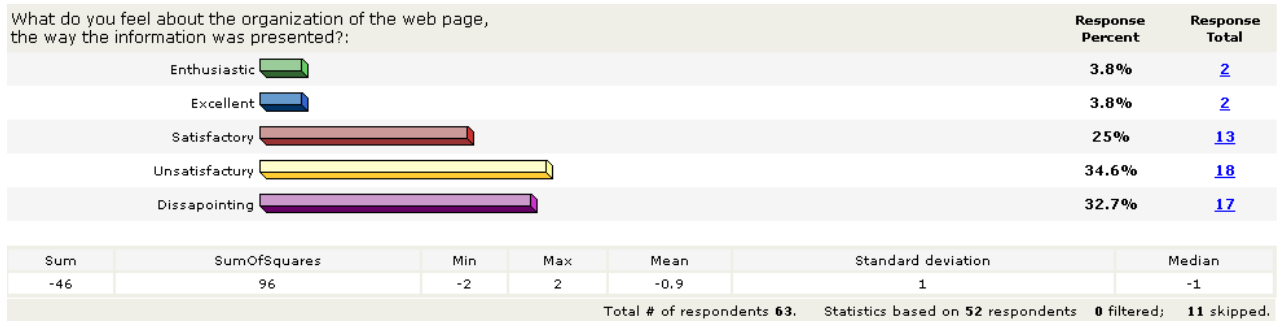
What do you feel about the organization of the web page, the way the information was presented?:

		Response Percent	Response Total
Enthusiastic		3.8%	2
Excellent		3.8%	2
Satisfactory		25%	13
Unsatisfactury		34.6%	18
Dissapointing		32.7%	17

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
-46	96	-2	2	-0.9	1	-1

Total # of respondents **63**. Statistics based on **52** respondents **0** filtered; **11** skipped.

Figure 21: Organization of the interface InSite factor analysis for NADI.

What do you feel about the organization of the web page, the way the information was presented?:

		Response Percent	Response Total
Enthusiastic		9.6%	5
Excellent		26.9%	14
Satisfactory		42.3%	22
Unsatisfactury		11.5%	6
Dissapointing		9.6%	5

Sum	SumOfSquares	Min	Max	Mean	Standard deviation	Median
8	60	-2	2	0.2	1.1	0

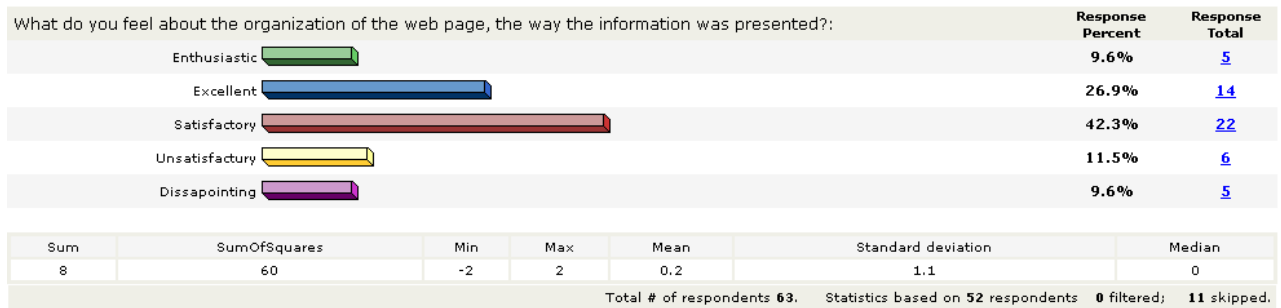Total # of respondents **63**. Statistics based on **52** respondents **0** filtered; **11** skipped.

Figure 22: Organization of the interface InSite factor analysis for ADI.

4. 3. TIMER

Because of an error by the researcher, due to a virus affecting the server where the timer information e-mails were collected and saved; only half of the participants' times were retrieved. It is important to save valuable research data at more than one location. However, 30 timer responses were sufficient to analyze the participants' browsing behavior with the two online stories.

The timer showed that the majority of the people read the two stories carefully in the average time frame. Short periods of time measured on a page showed that some of the participants browsed first the NADI and the ADI interfaces to see what would be next, and then went back to read the story. The majority of the instances of short time in the sequential browsing of a page were with the ADI. It is possible that the subjects got curious about the images rather than the story, as the images helped them understand the content or increased their curiosity.

5. CONCLUSIONS

This paper presented a research methodology for and an evaluation of the design of an emotional interface. The evaluation showed that people do have emotional responses towards design elements in interfaces. The research has also shown that the Asian people prefer more colorful interfaces with images rather than plain interfaces. The main contribution of this research however, is the research methodology for modeling and evaluating emotions in interfaces. This work presents an approach that can be used for exploring the emotional responses towards interaction systems, as well as adapting interfaces according to the user's emotions.

REFERENCES:

Aylett, R.; Schroeder, M. & Cowie, R. (2005) Keynote Speech 3: Developing a coherent approach to emotion-sensitive multimodal interfaces: the European Community's HUMAINE project, Affective computing and intelligent interaction international conference

Beck, J.E. (2005) Engagement tracing: using response times to model student disengagement, Artificial intelligence in education, Amsterdam, Nethrlands, 88-95

Burleson, W. & Picard, R.W. (2004) Affective agents: sustaining motivation to learn through failure and a state of stuck, in Maceio - Alagoas, B. (ed.)

Desmet, P. (2002) Designing emotions, TU-Delft

Dix, A.; Finley, J.; Abowd, G. & Beale, R. (1998) Human-computer interaction (2nd ed.) Prentice-Hall, Inc.

Nielsen, J. (1999) Designing Web Usability: The Practice of Simplicity, New Riders, Indianapolis, Indiana

Kort, B.; Reilly, R. & Picard, R.W. (2001) External Representation of Learning Process and Domain Knowledge: Affective State as a Determinate of its Structure and Function, MIT Media Laboratory

Laurel, B. (2003) Design research methods and perspectives, MIT Press, Cambridge, Massachusetts
Picard, R. (1997) Affective Computing, MIT Press
Markus, H.R. & Kitayama, S. (1991) Culture and the self: implications for cognition, emotion, and motivation, Psychological review, 98 (2), 224-253

Nielsen, J. (1999) Designing Web Usability: The Practice of Simplicity, New Riders, Indianapolis

Norman, D.A. (2004) Emotional design : why we love (or hate) everyday things
New York : Basic Books

Ortony, A.; Clore, G. & Collins, A. (1988) The cognitive structure of emotions, Cambridge University Press

Park, S.; Harada, A. & Igarashi, H. (2006) Influences of personal preference on product usability, ACM Press, New York, NY, USA, 87 - 92

Picard, R. & Healey, J. (1997) Affective wearables, Personal and Ubiquitous Computing, v.1, 231-240

Schrage, M.D. (1999) Serious play: how the world's best companies simulate to innovate, Harvard business school press