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USER INTERFACE DESIGN BY APPLYING THEORIES OF AESTHETICS

LAHTI UNIVERSITY OF APPLIED SCIENCES
Degree programme in
Business Information Technology
Bachelor Thesis
12 February 2012
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Degree Programme in Business Information Technology

FU, SIQI: User interface design by applying theories of Aesthetics

Bachelor's Thesis in Business Information Technology, total 51 pages, 4 pages of appendices

Spring 2012

ABSTRACT

The aim of this research paper is to figure out user's feelings about Graphical User Interface design on websites by adopting aesthetic theories. Five aesthetic principles are illustrated in the literature study, which are golden section, dynamic symmetry, Gestalt laws, colour harmony and Goethe's colour theory.

Qualitative research method is conducted as the way to explore user's behaviour and feelings. The researcher provides two websites, one of which is designed by breaking down all those five theories and another one is designed by following all the aesthetic principles.

Interviews are used as the method for collecting data from interviewees. The interviewees are selected from different faculties in Lahti University of Applied Sciences. Coding analysis method is utilized by converting the interview conversation records to text-based data. The coding analysis is done by highlighting and marking the important and related data, and analysising them by relating data to corresponding design theories.

The study found that the website design by applying aesthetic theories provided better visual effect and usability to user. It not only visually pleased the user, but also helped users accomplish specific task efficiently and accurately.

Keywords: Graphical User Interface, Aesthetics, principles, website design

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1 INTRODUCTION

1.1 Background

User Interface was started from command-line interface (CLI), which allows the user to accomplish specific tasks by typing commands. Then, the evolution continued with Menu-driven Interface, Form Fill-in Interface. Until to 1973, Xerox PARC demonstrated Graphical User Interfaced in the first time in the Alto personal computer (Reimer, 2006). That is a significant evolution on interfaces, which brings huge affections to computer systems and software. Nowadays, it is become the most popular used interface in various systems and applications.

Graphical User Interface (GUI) is adopting graphics and icons that allow the user to interact with computer system or devices. At some point, it is much more user-friendly than other kinds of interface since our humans are very visually oriented (Gregor, n.d.). Parkinson (n.d.) claimed in his article “The Power of Visual Communication” that human process graphical description is 60,000 times faster than textual description. As to website user’s behaviour, graphics and icons on an interface is more understandable and effective to the user. However, as to be a good user interface, graphics are not enough.

1.2 Statement of the Problem

In 1999, a research company named Market & Opinion Research International (MORI) raised a new term on behalf of Compaq, the UK’s largest PC manufacturer, called “computer rage”. A survey entitled “Rage against the Machine” indicated that four out of five computer users have broken their PCs because of computer problems. In spite of HCI research over the last more than twenty years, it still is a fact that many computer systems do not do what the user wants to do and every time when this situation happens, users always describe their difficulties as a “computer problem”. In fact, the real specific explanation could be a defect of software with lots of bugs, low-end hardware that slows down the time of processing data, or the user just has no clue about how to operate a computer system in a new working environment (Stone et al. 2005). Stone et al.

(2005) also indicated that most computer problems for individuals and the public occur as a result of poorly designed user interfaces.

A poorly designed interface may cause unhappiness, stress, loss of money, low efficiency and productivity. Even more, may threaten human life. Normally, as in a system, a poorly designed interface may lead to:

- More user time spent for performing their tasks
- Users causing more errors
- Dissatisfied feedback from users
- Users needing more time for learning how to use the system
- System only partially functioning for users
- Users refusing to use the system again

1.3 Research Objective and Methodology

The aim of this study is to find out whether graphic user interface designed by adopting aesthetic theories can bring better usability to users. This research paper may let developers and users have a better understanding about the influence of aesthetics in user interface design, especially several interface design rules are provided for helping web developers in their future design work.

Many GUI design guidelines strongly recommend aesthetics in their design principles. Edward Furey (N.d.) summarized on his website that "*Colour, contrast, graphics, photos and layout are aesthetic elements that enhance communication of information*." These elements in the website design play an essential role in communicating with potential users, which give information about "*trust this company*", "*buy this product*", "*read this information*", "*explore this area*", etc. Aesthetics in website design is able to send right messages to their users and let them achieve tasks efficiently and correctly.

In this thesis, an overview study of framework and literature review has been made in order to get a basic idea about how to design an aesthetic website. After the study, the researcher designed two websites for investigation use. One of them is designed by fully based on the aesthetic rules, which are found in the literature

review study. Another website is designed by breaking down every aesthetic rule and the researcher named it as the non-aesthetic website. The two websites have been illustrated to the interviewees during the interview and let them interacted with them. Data collection and data analysis research procedures have been used for finding the result of the research (see Figure 1).

Figure 1: Research process

1.4 Overview of Thesis

Chapter two introduces the research approaches that have been adopted in this research paper. The research question is indicated at the beginning of this Chapter, and then, the concepture framework of the research shows different concepts related to the study. After that, the whole process of the research methods have been explained, which include research approach, data collection approach and data analysis approach.

Chapter three provides a theoretical literature review about aesthetic theories, which can be adopted in GUI design. The theories cover the web interface design on screen layout, the position of elements and carefully selecting of colours.

Chapter four explains the ideas of user interface design in a non-aesthetic website, and an aesthetic one which designed by based on the theories from the previous Chapter. Both of the websites have the same function and theme for investigation. The ideas about how to construct a non-aesthetic website by breaking down all the principles on its design, and how to build a fully aesthetic-based website by nicely adopting all the principles are detailly introduced.

Chapter five reveals the practical data for analysising. The process of analysis by using coding analysis method is introduced in this Chapter.

Chapter six concludes the analysis results, findings and the summarizing of overview process of research in this research paper. In Chapter seven, it is the finish off of the thesis, which indicates the limitation, validity and future suggestions of the research.

The following Figure 2 indicates the structure of the thesis:

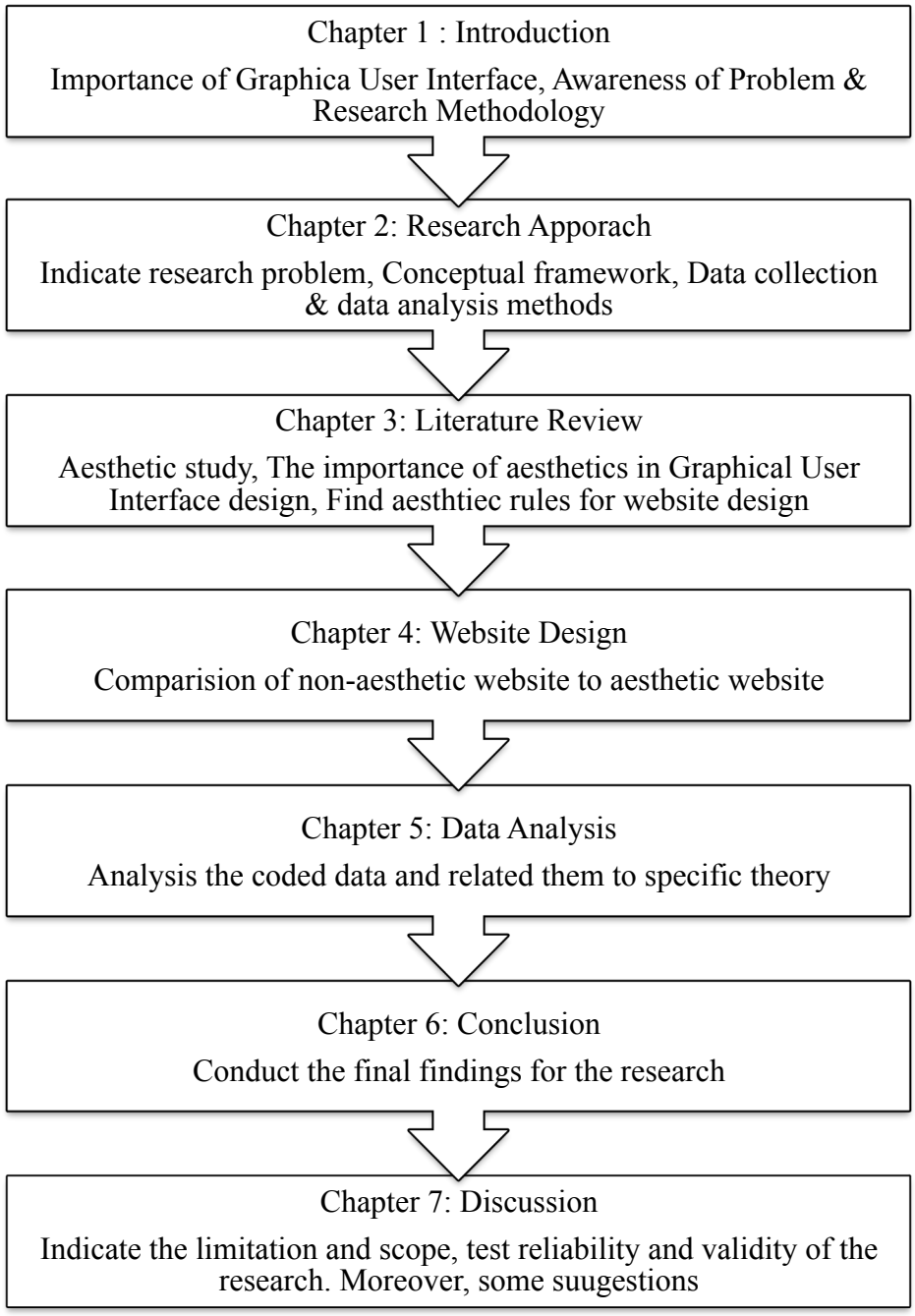

Figure 2: Thesis structure

2 RESEARCH APPROACH

2.1 Research Problem

This research paper investigates the key theme about user interface design by applying the aesthetic rules, in order to find out whether the aesthetics-based interface could bring a better effect to the user. The research study is focusing on the main research question: How does the user feel about the web application whose user interface is designed by applying aesthetic theories?

2.2 Research Framework

In this research framework, it is constructed by four concepts, which are all based on the literature review study. The first concept is concerning aesthetics theories that have been widely used since the time of ancients of Greek, and it also introduced the importance of aesthetics in people's daily life.

The second concept is user interface. It summarized the role of Graphical User Interface in computer system and webpages.

The Third concept is the combination of previous two concepts, which summarized the aesthetics that has been used in user interface design. Last but not the least, in concept four, it conducted the study of the aesthetic designing principles in user interface (see Figure 3).

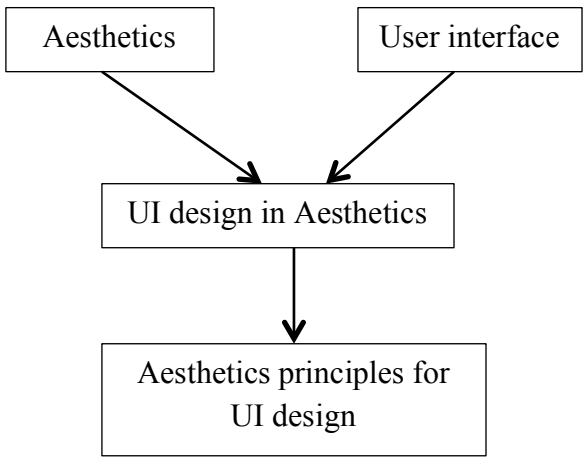

Figure 3: Research framework diagram

2.3 Research Method

As Goddard and Melville (2001) assert that research is a process of expanding the boundary of the knowledge that human usually neglect. A good research can answer the unknowed question or create new theories that have not existed yet.

In this thesis, in order to build a good research, it started from the problem statement about user interface in today's life, and then raised the research question. This research started from a literature review study about the aesthetic rules that have been used in user interface, and then, two websites have constructed for investigation and data collection. After collecting and analysing all the data, the conclusion has permitted to answer the research question and in this way to reach the research goal (see Figure 4).

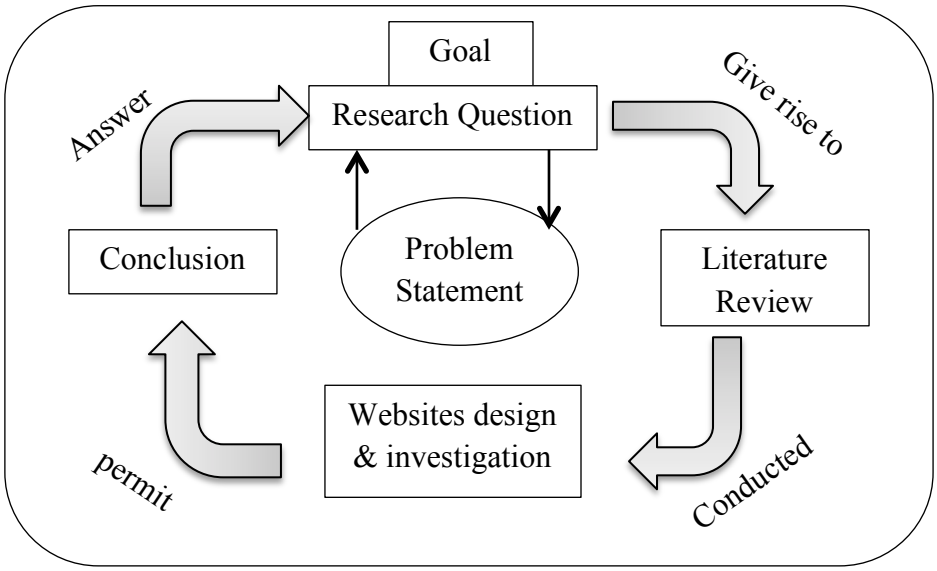

Figure 4: Conceptual map of research

Qualitative research methods have been adopted in this research study, because this approach is more concentrated on seeking answers that are not predefined, so researchers only know roughly what should be looking for (Taylor & Bogdan, 1998). It is able to provide a complex textual description about how people experienced and behaved in a given research issue, helping to interpret a better

understanding of a complex reality situation and the implications of qualitative data such as human behaviour and the reasons that form such behaviours.

Unlike quantitative research, qualitative research method is more flexible to hold interviews with open-ended questions, which means the questions concerning why and how it happened but not just what, where and when (Bernard, 1995). In this thesis, it investigates a research question about how does user feel about the interfaces, so this research methods can lead the research in a right direction. Woods (2006) also agree that qualitative research method is a way to discover human behaviour and the reasons for various phenomenons, how they explain the situations and what their perspectives are on different issues. Qualitative research is suitable for practical support for research hypotheses (Flyvbjerg, 2006). For example, in this research paper, author think that web user interface design by using aesthetic principles can bring a better usability to the user. So, this research method has adopted for hypothesis testing.

For general research, it mostly refers to two broad methods of reasoning, which are deductive and inductive approaches (Trochim & Donnelly, 2007). Deductive approach has been used in this research paper, because as Trochim & Donnelly (2007) defined that, deductive approach works from a general theory to the more specific findings. Normally, people call it "top-down" approach, which starts from a general theory about the topic. The researcher needs to narrow down it into more specific hypotheses, so that the researcher can collect data and analysis data for conformation results.

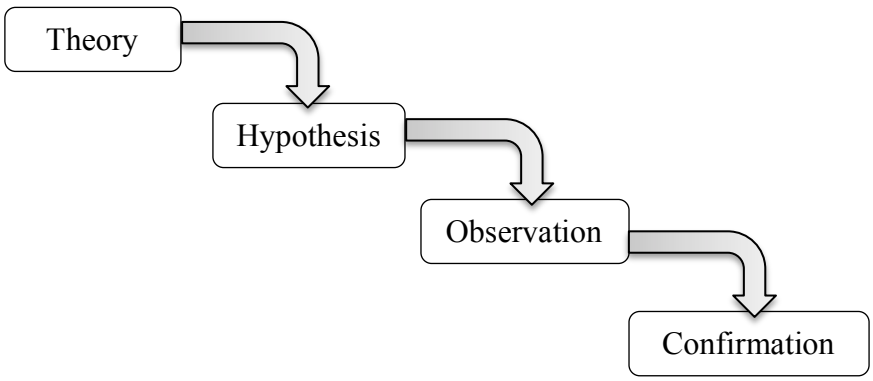

Figure 5: Deductive approach (Trochim & Donnelly, 2007)

In this paper, the researcher first started from the literature review study and found out the theories concerning aesthetics rules that have been adopted on web interface design. Second procedure is to summarize all the theories concerning to the design rules. Thirdly, designing the websites based on the aesthetic principles. Lastly, collecting all the data from the investigation and analysising it for getting the result to confirm the theories.

2.3.1 Data Collection

Consider this research is all about user's feelings to the website interface, interviews, the most challenging and rewarding way of measurement, have been adopted as the method for the research. As McNamara (1999) described that interviews in qualitative research are extremely useful, which could get the story behind a participant's experiences and go further to get the in-depth information around the topic. Kvale (1996) also agree that interviews allow people to communicate and transfer information from others perspective and in their own words, that helps researcher understanding the truth and sitiation from the objective point of view, and also explore more from the participant's daily experience. Interviews are structured and controlled by the researcher, which proceed just like normal everyday life conversations. Interviewees may say something that is not related to the object information, but it still valuable to capture the subject view to the research (Kvale, 1996). So, interviews as a qualitative research method is not only find out the objective data but also consist the meaningful relations to the research.

The main task in qualitative research interviews is to understand the meaning of what the interviewees say, and generally it should cover both factual and a meaning level (Kvale, 1996). However, there is a fact that, normally it is difficult to reach a meaning level. For interviewers, there is no ready-made categories for the interview, so it usually starts from open and wide topic and bring interviewee comfortable and relaxing atmosphere.

Kvale (1996) recommends that, the interviews can be organized to seven stages:

thermalizing, designing, interview, transcribing, analysing, verifying and reporting (see Figure 6).

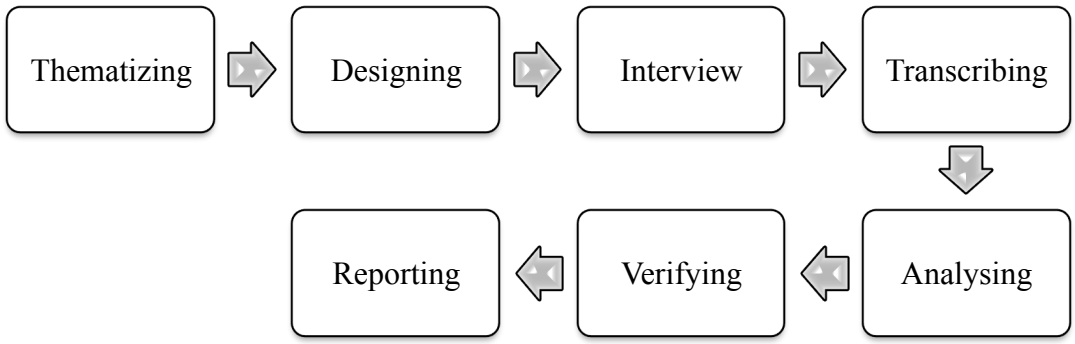

Figure 6: Seven stages of interview

The interviews research method in this thesis is done based on those seven stages. In thermalizing stage, the researcher has determined the purpose of the investigation and organizes the concept of interviews before it started. After the design of the study, the interviews are conducted according to the interview guide. And then, transcribing can be done by transfering oral conversation to text-based information. Appropriate analysis methods are adopted in order to find out the answer of the research. So last but not least is verifying the results and reporting it.

The face-to-face interview method is used for collecting data in this research paper. Unstructured interviews are frequently used as the most open-ended approaches of interviewing, and questions during the interviews can be changed or adapted based on the respondents behave. Even though, some key questions related with the research need be prepared before the interviews (Anderson, 2010). The advantages of the unstructured interview are – it is very flexible and able to find out more valuable information because the questions can be easily changed according to what the interviewee said, and the relaxing and freely conversations led interviewees more willing to talk and share their experiences. Researcher can also find out important information, which seem not relevant to the topic and ask the interviewee to go further into the topic.

During the research, the unstructured interviews are conducted for understanding the user's feeling about the website, which the user interface of the website is

designed by applying aesthetics rules. In order to provide a contrast to the research, the researcher prepares two websites beforehand (as it mentioned in Chapter 4 website design), one of them is designed all based on aesthetic theories and another website is designed by ignoring aesthetic rules on user interface. Those websites are illustrated to the interviewee during the interview and interviewees interacted with those two websites and gave some feedbacks.

The prepared object questions in the interviews are:

- How do you feel about those two website?
- Do you think website 1 is easier to use compare to website 2? Why do you think so?
- How do you feel the layout of those two websites? Which one looks more beautiful?
- How do you feel about the colour of the websites? Which one looks more comfortable?
- How do you feel the distribution of the website? Which one is easier to read, find information and help to accomplish a specific task?
- What do you feel about the content in those websites?
- Which one you prefer to use? Why?

The reason for asking those questions is because they are close related with the research question, and user's feelings concerning the different parts of the websites could indicate the impact of aesthetic rules which are adopted in the website. Those related information is essential data for data analysis phase, in order to find out the answers of research.

Three students in Lahti University of Applied Sciences are selected as the interviewees for the research. The interviewees are picked from different Faculties in the University those are Faculty of Business, Faculty of IT and Faculty of Art. The reason for choosing interviewees in this way is because considering those students in our University are having different fields of study and they may have a different user background and experiences in user interface. So in this search, the results analysed from the data collected in different groups were more reliable and accurate than collected in a single group.

2.3.2 Data Analysis

The data analysed by using coding methods, because coding and categorizing the data plays an essential role in qualitative data analysis.

Coding analysis method is a method that converts recorded interviews or group conversations into written words (Coding for content analysis, 2011). It involves subdividing the collected data and assigns them into relevant categories (Dey, 1993).

In this research paper, every interview was recoded by mobile phone. After the recoding step has done, all the data was transferred to textual data by the researcher. And then, the data was analysed by highlighting and underlining the important messages from text-based interview papers. After that, different data was categorized based on the user's feeling about aesthetic and non-aesthetic websites. Moreover, the data concerning the design of layout, elements and colours on those websites need to be analysed separately. Only in this way, the researcher is able to test each aesthetic principle individually. Last but not the least, few comparisons of categorized data with the theories have been done by this analysis method.

3 LITERATURE REVIEW

3.1 Philosophy of Aesthetics

The word ”Aesthetics” derives from the Greek language “aisthetikos” meaning of sense of perception. It is a philosophy study about aesthetics concentrates on beauty and tastes, which are sensory values from human senses (Ford, 2009). The evaluation or judgment standard of beauty was referring to the philosophical breakthrough from arts and nature. Ford (2009) stated a subarea of theory about the philosophy of art that, “*aesthetics involves ways of seeing and perceiving the world*”, it can be used as a standard measurement of a particular style or design.

The theory takes account not just on an individual object but also for all the things that are related as a whole, all of its parts are combined in a way of harmonious, which is what we called as beautiful (Townsend, 1997). For example, when people see a painting, they do not feel that each individual objects are nice but view the painting as a whole. The distribution and combination of related objects and intelligently chose of colour constructed a harmonious picture of trees, sky and lakes. Another example as we take on human, when people comment a girl is beautiful, is not because she has a beautiful nose or eyes, but the harmonious of every element on her face provide a confortable feeling to others (Ch’ng, Simulation of a design environment for users to incorporate proportioning systems into screen design , 2002). So, the more perfect the features are, a more near to the standard of aesthetics is.

Retrospect the aesthetics roots in ancient Greece, thinkers like Socrates and Plato also used aesthetics to critique the art the design by considerating the inherent meaning and beauty of things (Ford, 2009). In the great civilization of history, the most influence on the development of aesthetics were Greece, and their philosophers firstly felt that the objects, which have aesthetically appealing, were beautiful inside of themselves (Cline).

3.2 The Importance of a Good User Interface

Graphical User Interface (GUI) design is the design of software, system, application, websites and all kinds of electronic devices or products based on the user's experience and interaction (Zetie, 1995). The goal of the user interface design is try to achieve a simple, efficiency and user-friendly interaction, in terms of provide the user a good balance of usability and fancy visual sense.

The user's feedback during the developing of user interface let developers realized that, there is a great necessary to design and implement a good user interface that not only helps the user perform tasks efficiently and productivity, but also stimulate the user's interests for keeping using the system (Ch'ng, Simulation of a design environment for users to incorporate proportioning systems into screen design , 2002). However, computer systems are different from other systems. For instance, digital watches or Microwave ovens, they generally have buttons, digital display or a touchpad which users can interact them by just press the buttons (Stone et al. 2005). But, for a computer system, it is the combination of hardware and software that receive user input and manipulate the system output for assisting users to achieve certain tasks. So, frankly speaking, user interface is part of the system and from the user's view of computer systems, the use of the interface is always limited and based on his or her using experience of the user interface (see Figure 7).

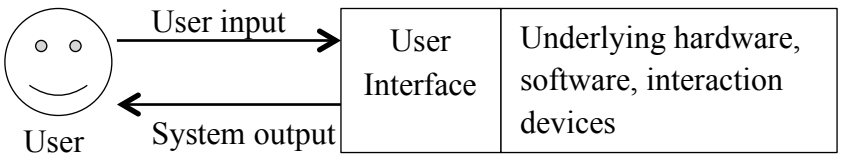

Figure 7: As to users, user interface is part of the computer system (Constantine & Lockwood, 1999)

Nowadays, the advent of graphics pushes user interface to another stage in the evolution of interface design. Design rules like grouping and alignments are still remained from the original concept; elements like stylish layout and simple controls make user interaction more efficient (Ch'ng, Simulation of a design environment for users to incorporate proportioning systems into screen design ,

2002). Even though, a visually attractive website could not guarantee the usability to its user interface, aesthetic still plays the key role in a high usability interface. According Dix et al. (1998) 's explanation

"*A pretty interface is not necessarily a good interface. Ideally, as with any well-designed item, an interface should be aesthetically pleasing. Indeed, good graphic design and attractive displays can increase users' satisfaction and thus improve productivity.*"

Zetie (1995) also agree that, if the interface acquires user satisfaction and motivation, a long-term interest can be remained to the system. The same opinion from Wesley (1997), not only the system but also web application, if a website cannot pleasure user by visual effect, they will not spend more time on it.

Arlov (1997) assumed that a good visually screen design makes website easier to understand. Aspillage (1991) also agree that, good graphical design helps the transfer of information. Besides, the carefully selection of colour by following aesthetic rule could provide higher the accessibility to the website. So, it is important to consider all the aesthetic theories before starting a web design project.

3.3 User Interface Design in Aesthetics

In this section, it introduces aesthetic theories from three aspects of web interface design, which are the screen layout of website, the distribution of elements (includes buttons, text, textbox and so on) and the use of colour on the web pages. The selected GUI design principles from aesthetic theories are listed as follow:

- Golden section
- Dynamic symmetry
- The Gestalt laws
- Colour harmony
- Goethe's colour theories

The reason to choose those theories is because they are close related the website user interface design from the aspect of screen layout, element distribution and the use of colours. For instance, the theories of golden section and dynamic symmetry can be perfectly adopted as the layout design by combining grids layout design methods.

3.3.1 Screen Layout

The organization of the screen and layout design provides enormous effect during the user's interaction with the windows. An investigation study by Tullis (1981) illustrated that the user achieves task faster when he or she interacts with a screen that is well structured. This research test allows few users to use two different layouts of the system and try to accomplish the same task. The result of the research found out that the average time the user spends on a clutter interface was 8.3 seconds and for the well-structured interface it just took 5.0 seconds.

What kind of layout is able to visually pleased and provides the high usability to users? As to the guideline of layout design provided by Windows, the effective layout present the following attributes:

- Showing off important message
- Easy to find information at a glance.
- The window is resizable in a condition at the content is still in the corresponding position.
- The content and images distributed in a balance way.
- The simpler the better.
- Similar windows or pages adopt a similar layout.

However, Ghyka (1952) see the design of the layout in a different aspect, he claimed, "The concept of proportion is in composition the most important one." Then what is proportion? And, how to deal with proportion on screen layout design?

A proportion is an equation with a ratio on each side. For example "3/4 = 6/8", the statement is equal to the same ratio 0,75 and we say the expression connected by proportion.

Aesthetic principle study 1: Golden Section

When talking about the proportion of Aesthetics, golden proportion must be the key theory people may come up with. It first used in the early of the 20th century by Mark Barr with the Greek letter φ (pronounce "phi") to present the ratio (Weisstein, n.d.). This golden ratio is also generally called the "golden proportion", "divine proportion", "golden mean" and so on. The equation can be expressed as 1.618 = height / width = φ. As to line segments, it shows as follow (see Figure 8):

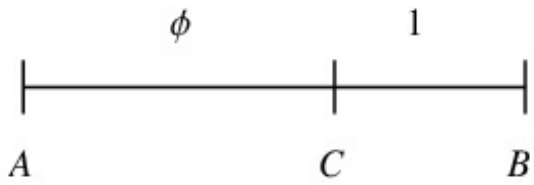

Figure 8: C divides the line segment AB based on golden ratio (Weisstein, n.d.)

One surprising connection has been found in the golden section is that it exists continous factors in the shape of the golden ratio (Huntley, 1970). For instance, by given a golden rectangle with the ratio of 1: 1.618, it can be divided into a square as one part of the shape, and what the researcher find out the other part of rectangle is a new golden rectangle with the same ratio as the bigger one (see Figure 9).

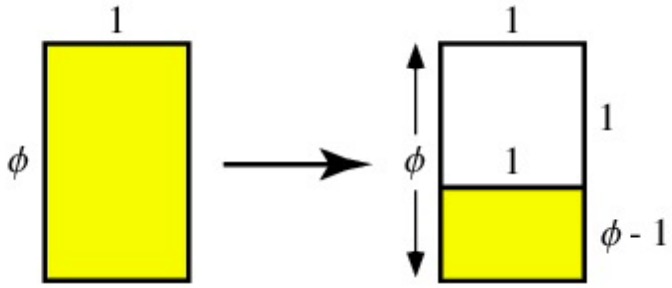

Figure 9: Continues factor in golden rectangle (Weisstein, n.d.)

Nowadays, computer systems or website's graphic user interface design more or less adopt the golden ratio as its layout such as windows system, chunks in the

website. Golden section is important on website design, it provides some natural sense of order, harmony, balance and comfort to visitors so that may improve the usability of a website (Friedman, 2008).

As following example (see Figure 10) provided by Friedman (2008) illustrates the layout design for a webpage by using divine proportion. He explained that, the golden section layout can visually appealing visitors and it improves not only the communication of webpage design, but also improve further details of the layouts, which constructed beautiful composition (Friedman, 2008).

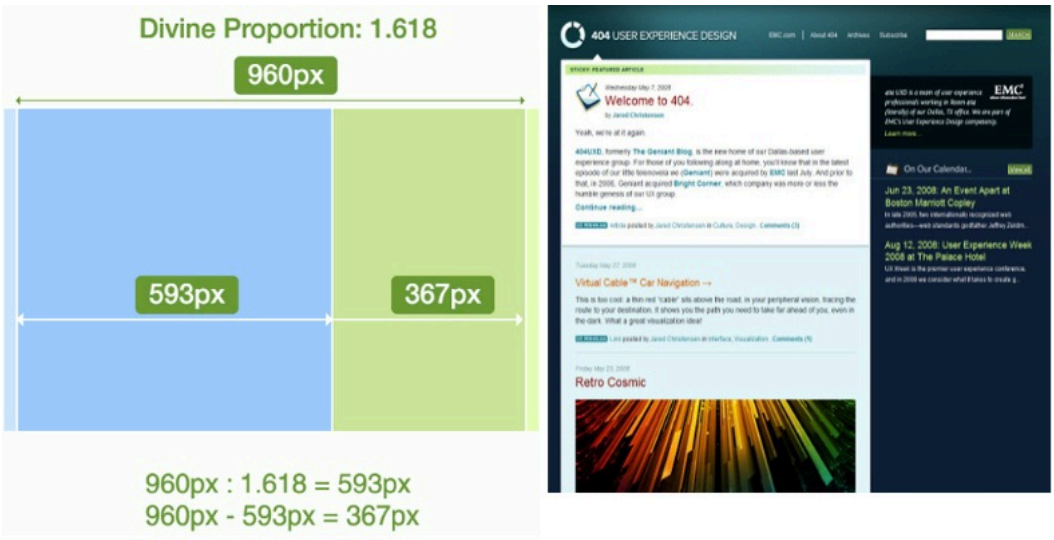

Figure 10: Golden section in layout design

Aesthetic principle study 2: Dynamic symmetry

Hambidge (2003) stated that Dynamic symmetry is a proportioning system and natural design methodology, which use dynamic rectangles (see Figure 11) based on ratios like √2, √3, √5, golden ratio φ, √φ and φ2 (Hambidge, 2003). This golden ratio can be found almost everywhere in architecture, status, and paintings and even in human body. Artists may draw the pictures with those ratios unconsciously, that's due to the experience they gained with painting. Architect design buildings may follow those ratio consider stability and beautiful. That is also what human visually feel beautiful from (Ngo & Ch'ng, 2001).

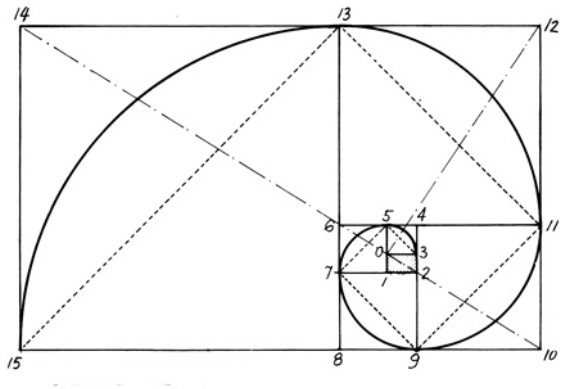

Figure 11: Dynamic symmetry (Picture from PrintPlace)

Several guidelines documents have proposed that user interface design on screen should provide some level of aesthetic layout rules such as symmetrical balance. Mullet and Sano (1995) stated, *"...Heavy use of symmetrical layouts…is perfectly appropriate for a user interface*." Some user interface standards, such as OSF/Motif, also strongly encourage applying symmetrical layout as the arrangement of windows and dialog boxes.

Design website layout with grid-based approach helps designer to design from the backbone of the website, and it is good for practical designers that can design several structure for select and use, and it is time saving especially to avoid mistakes from the beginning of design (Ch'ng & Ngo, 2003). The grid might not essential for a perfect design, but math could approve that appropriate grid design provides better ratio for layout and elements.

Based on Ch'ng and Ngo's (2003) research study about combine gird-based method with dynamic symmetry on screen design, it shows that there is a large number of systems or websites have adopted dynamic symmetry on its layout design. Human eyes normally feel visually confortable when symmetry exists on the screen. They indicated that any rectangles constructed by point to point combination on a golden rectangle could also brings visually pleasing to human, such as the ratios root -1, root -2, root -4, root -5, phi square and root -phi (Hambidge, 2003). The ratio on rectangles could form different themes on website layout, it is very flexible for designers to develop an aesthetic webpage with various layout themes.

3.3.2 Element Distribution

In Windows user experience guideline, it encourages a term on user interface design called ”visual hierarchy”, which means the appearance of the element on a page shows priority of the elements and text, and the relationship between those elements. It indicates several suggestions that need to be aware of when design the interface:

- Highlighting important text attracting users’ focus
- The browsing flow should be very clear on the surface, smoothly and naturally user interface helps advance the usability of the element.
- Logically grouping related items together and separate the unrelated items in order to have a clear visual.
- Emphasis important items or messages.
- Align elements to a corresponding place so that it could appear orderly, and easier for scan.

Aesthetic principle study 3: The Gestalt laws

In order to construct a beauty and orderly website on a blank computer screen, coordinating different elements on the webpage consider as an important factor on website design.

The Gestalt laws, which are included in aesthetics, are popular adopted by many designers. There are six principles in Gestalt psychology that can be related with content and text design on webpages (Tuck, 2010), which are:

- Law of Proximity. Things are close together, from human eyes, it looks belonging together.
- Law of Similarity. Grouping similar elements together.
- Law of Common Fate. The elements appears to move in the same direction
- Law of Good Continuity. Figures or text looks continuously in a line.

- Law of Closure. Group the figures that are closed, and if the figure is not complete, from human eyes, the figure is filled in automatically by mind.
- Law of Prägnanz (Figure and Ground). Human eyes differentiate the object based on the background (Gestalt Theory of Visual Perception).

Tuck (2010) indicated that the use of Gestalt laws could enhance usability of website since all the elements on the webpages are well organized and grouped, user may find information and browsing more effectively. One of the examples Tuck (2010) suggested that law of Proximity, for instance, could be adopted on site navigation, groups the links together not only externally but also internally (see Figure 12).

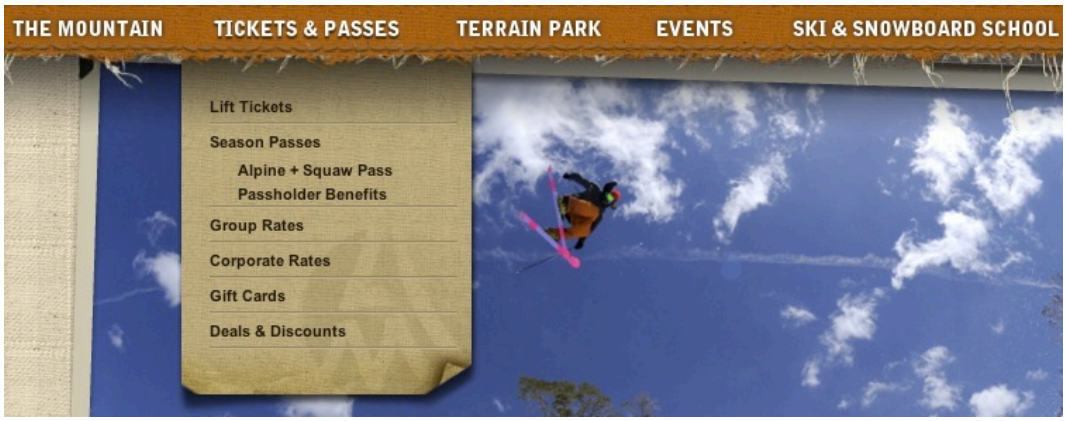

Figure 12: Law of proximity on website navigation (picture from http://www.skialpine.com/)

These principles are very applicable for GUI design on website since the idea of those principles are try to provide the user a better visual and understanding about the interface and could read and find information fast and accurately.

3.3.3 Colour Theories

Noack (2010) claimed that the most important factor in any design is the colour choices the designer made. For a website, designers create its layout style, the functional effect and all the compositions, the essential finish touch mostly based on its colour. Holzschlag (2001) also agreed that the colour illustrated on websites is different from the arts or an object, the colour appears on websites can show

different effects to the whole user interface, because they can complement or conflict each other as its works in harmony.

Aesthetic principle study 4: Colour harmony

Red, blue and yellow are three base colours, which also called primary colours, mixed and created all the other colours on the colour wheel. Consider the colour harmony that is visually pleasing by human, designers realize that the colour combination for constructing a colour theme on websites is essential (Noack, 2010). The colours can be categorized based on its emotion meaning and relationships on the colour wheel.

- Complimentary colours. The colours that are choosing from the colour wheel, which is opposite to each other. This combination creates high contrast and brighten look, it is suitable for outstanding and highlighting information, but it works badly on text because human eyes may feel jarring with this theme with text.
- Analogous colours. In this colour theme, the colours are chose from the colour wheel that is next to each other. It is popular used on background themes and layout design on webpages, so that it provides comfortable sense and feelings to human since this combination is very nature and harmonious (TigerMedia, n.d.).
- Warm colours. It refers to the colours that can bring warm feel to human eyes, that is the colour close to red, yellow and orange.
- Cool colours. Opposite to warm colours, which can bring cool feeling to people, the colours like blue, green and purple (Noack, 2010).

However, a good website should show not only the beauty of the design, but also show a nice usability and accessibility. Consider the user who has defect with colours, designers need to choose colours more carefully and provide better solutions for the minority group. Hess (2000) suggested that, indicated the function on the element instead to sense the colours. For example, show the text such as “Continue”, “Help”, or “Quit” on the buttons instead of the instruction like “*Click the Green button to continue, the Yellow button if you need help, or the*

Red button if you want to quit". Moreover, Hess (2000) also claimed "*one important aspect of colour choice is strong contrast between foreground and background colours, which makes the text easy to read*". So, a better contrast to the text could more or less help the colour blindness user since they see the colour different than normal people do.

Aesthetic principle study 5: Goethe's colour theories

According to Goethe's colour theories (1810), he stated that a dark object appears smaller than a bright one of the same size. He approved this theory by placing a white disk on a black ground and a black disk on a white ground; both disks are exactly the same size. However, from human's visual sense, when the objects can be seen together at some distance, human feel the last to be about fifth part smaller than the other. And if the black circle were made larger by so much, they will appear equal (Goethe, 1810). So from these theories, web designers for example, may choose light colour with the dark ground as the website's logo so that it could provide more outstanding visual effect to users.

4 WEBSITE DESIGN

In order to have a comparison between an aesthetic website and a non-aesthetic website, the thesis writer developed two websites with the same theme and functions for testing and investigation in this research. In this Chapter, two websites are illustrated, and the corresponding explanations about how the website is ignored or adopted aesthetic theories in its design are explained. The websites are design by using Adobe Photoshop CS5 for the resource library images and Adobe Flash CS5.5 is adopted for design and implement the whole websites.

4.1 The Non-aesthetic Website

The first website was designed by breaking down all the aesthetic rules as it is mentioned in previous Chapter (see Figure 13). The rules are breaking down by adopting the theories in an opposite way.

Figure 13: The website designed by breaking down aesthetic principles

- ***Break golden section principle***

As the screen shots image illustrated above, the website firstly breaks golden section principle on its layout design. The height and weight of the website is defined as 800×600 pixels, which do not fulfill the ratio of golden rectangle (1.618), as well as the screen layout and compositions.

- ***Break dynamic symmetry principle***

Secondly, the website user interface did not follow dynamic symmetry principle since the ratio of rectangles on the webpage do not match ratios like root -1, root -2, root -4, root -5, phi square and root -phi. The banner and information panel are sized by a randomly space that try to ignore the golden ratios as Hambidge (2003) mentioned in dynamic symmetry theory.

- ***Break Gestalt laws on element distribution***

Thirdly, the elements distribution on this website breaks the principle by the position of buttons, logo text and images (see Figure 14) which are illustrated in Figure 13 and Figure 14.

Figure 14: The non-aesthetic website breaks down Gestalt laws in Gallery Page

For the navigation buttons, it breaks the law of Proximity and law of Similarity. For example, the contact button is located at the lower right corner, which is isolated with other buttons. And the shape and colour of the buttons are different, that shows opposite to law of Similarity. Same situation to the logo text in banner, the text “flower” and “gallery” illustrates different font family and font size, and they are not align in a same line. Moreover, the images show on Gallery page, they are placed quite in a randomly place and with various sizes, which did not consider the law of Good Continuity at all. Furthermore, the website did not doping any highlighting style in the content, for example in Figure 13, the title and content show the same font size and style in the information panel.

- ***Break colour harmony principle***

Complimentary colours are adopted to the logo and background colour of banner, primary colour “red” is used on the logo, and “dark green” is used as the background colour of banner. These two colours are almost opposite to each other on the colour wheel, it may shows outstanding for the logo but not harmony to other colours in the website as a whole.

For the text on the information panel (see Figure 13), it shows low contrast as it appears, because analogous colours have been used. These colour combinations are choose from the colour that is close to each other on the colour wheel, which is also a opposite choice in colour harmony theory for the colour on text. Similar design on the text on navigation buttons such as the button “shops” and especially the logo text on banner; those colours are selected from the colour wheel, which is very near to each other. It provides low contrast to the text, and also for colour blindness user, they may not able to distinguish the text from it background colour.

- ***Break Goethe’s colour theories***

On the home page, the white text colour with light green background colour also breaks the previous colour harmony principle. Moreover, the title of the text just illustrated the same colour, style and font size to the content text, which just hides

the important message to user. Base on Goethe's colour theories, dark background with light text colour (and maybe bold the text) shows high contrast to human eyes, so in this colour design part, the designer also breaks this rule.

4.2 The Aesthetic Website Design

What does a truly aesthetic website should look like? And how to follow those principles in its GUI design? In this section, an aesthetic website is showed and explained the design process by adopting aesthetic principles. Here is the website looks like (see Figure 15):

Figure 15: The aesthetic website

4.2.1 Website Layout Design

Based on the literature review study about the aesthetic principles. The design algorithms for this website's layout are descripted as below (see Figure 16):

1) Define the height and weight of the website as in ratio 1.618. In this website, the pixels are defined as 1000×618 pixels in Photoshop.

2) Draw the first grids by connect the diagonals in the rectangle, and draw other four lines from the corner point of rectangle and vertically joint to diagonal line.
3) Connect any points by straight lines in the rectangle horizontally or vertically to specific the girds.
4) Scratch the position and size of the elements on the grids by hitting the points on the grids.
5) Draw and position the elements on the grids by putting them as near as possible to the grids.
6) After save the elements from Photoshop to images with .png format, draw the same grids in Flash, and import all the elements images into Adobe Flash library.
7) Position element images and add interact and actions to those elements in Flash.

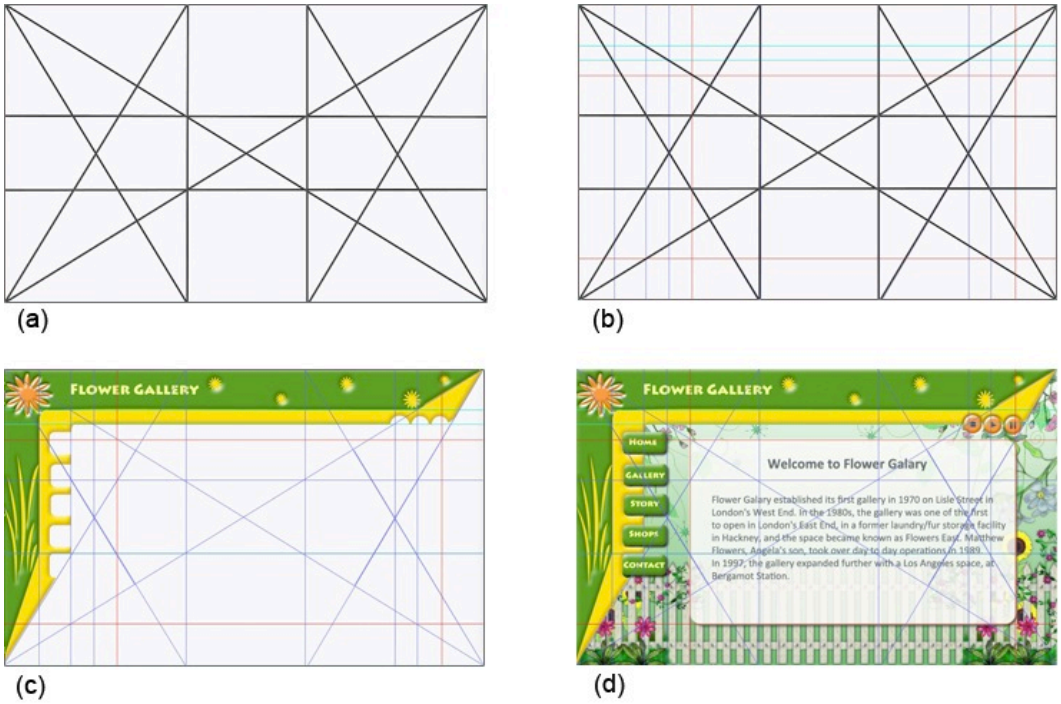

Figure 16: The aesthetic website layout design process. (a) The first level grids on golden rectangle. (b) Connect more horizontal and virtual line to construct more specific grids. (c) Position the element by importing them to Adobe Flash workspace. (d) Final look to aesthetic website by adding interaction and action for the buttons.

This layout has successfully adopted golden section principle and dynamic symmetry principle in its GUI design.

4.2.2 Element Distribution Design

In the design of this aesthetic website, the Gestalt laws have been adopted for the elements distribution design (see Figure 17).

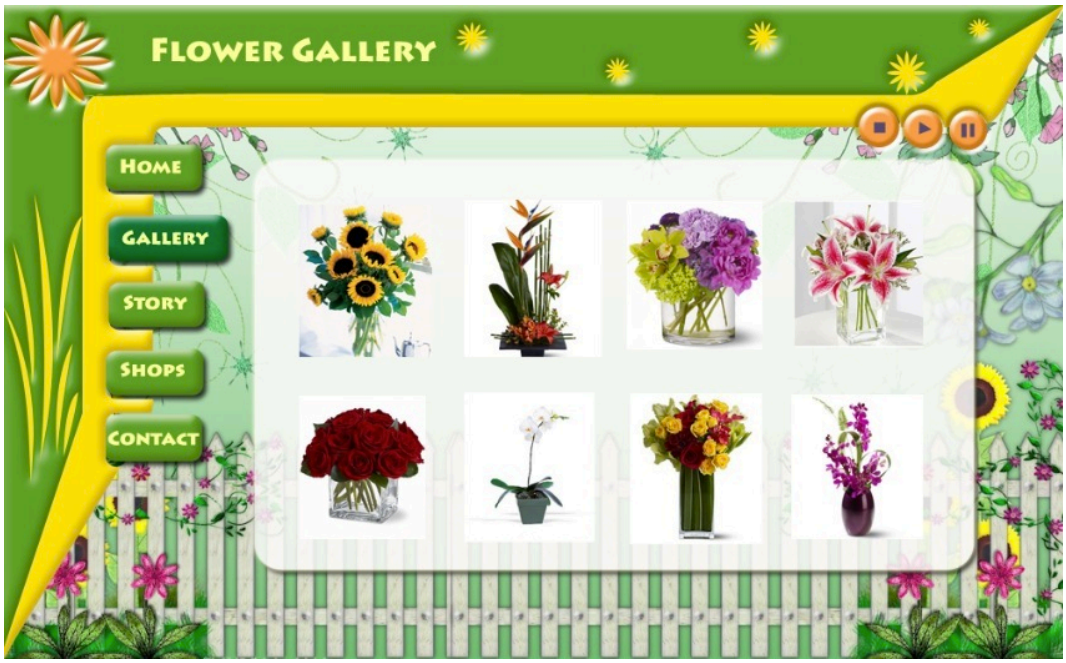

Figure 17: The aesthetic website by using Gestalt laws in its elements distribution design

Firstly, the logo text on banner appears the same font family and size, and they are close to each other, which fulfil the law of Proximity and law of Similarity. And then, the logo and other patterns on the banner are well organized that could show balance and comfortable feelings.

Secondly, the navigation buttons on the webpage is designed also by adopting Similarity and Proximity laws in the Gestalt laws. In Figure 15, they followed the same style on the button in order to show they belong together and work as similar function, which is the same situation to those three orange buttons on the right button of the banner. Furthermore, in Figure 17, when user is in Gallery

page, the “Gallery” button effect differently to others, this just try to show user that they are in this specific page in case they forget where they are.

Thirdly, in the gallery page, the flower images are placed appropriately on information panel, which have been adopted law of Similarity, law of Good Continuity and law of Closure. Because for law of Similarity, the images displayed in the same size that shows they are similar factors in this page. For law of Good Continuity showed that those images are organized into lines, and for law of Closure, it illustrated by the space between the images since they are not to wide, that could visually fulfilled by human eyes.

4.2.3 Use of Colour

The main colours for this website is grass green and yellow since they are related to the theme of flower gallery. On the banner, there are green, yellow and orange colours are close next to each other on colour wheel, so they could provide harmony on the webpage. Even on the clicked button (such as ”Gallery” in Figure 17) appears dark green also illustrates colour harmony to other colours.

The colour for buttons shows good contrast, even though yellow text with green background is not the highest contrast colour combination, the bold font helps the text provide good enough contrast to users.

In Figure 15, the content in home page used white background colour with 85% transparency and dark grey as the text colour. The reason for choose these colours are because white and dark grey provide high contrast to its text, and the transparency to the information panel can faintly see the background images in the back, which let user see the whole ”garden” images as a whole. Even though white with black can provide the highest contrast, this colour combination can make user feel dazzling and tired for eyes when user need to read large amount of text with these colours.

5 DATA ANALYSIS

The aim of the research is to find out user's feelings about the GUI design of two websites, so coding analysis method is adopted as a way to analysis the collected data from interviews in order to find out the answer of the research.

In the following table (see Figure 18), it illustrates the coded data by categorizing them into two categories, which are the data concerning the aesthetic website and data related to the non-aesthetic website. The reason to separate the coded data in this way is because it is easy to compare an aesthetic website to a non-aesthetic website by testing those aesthetic theories. Moreover, it can clearly understand users feelings from those websites.

Categories	**Coded Data**
Aesthetic website	Very beautiful (layout & colour) Much better than another one Very clear Conventional (layout) Can easily find information (layout) Clean and tidy (layout) Feel comfortable (colour) Easy to use Willing to read the content (colour) Prefer this one
Non-aesthetic website	Don't want to spent time on it (layout & colour) Text is difficult to read (colour) The layout is messy and disordered The layout looks very strange and not clear Don't like the general website Feel uncomfortable (colour) The colour scheme is killing my eyes Don't feel like to read the content Don't want to use this one

	Confusing me Out of order Not professional

Figure 18: Coded data for two websites

Based on the coded data about user's feelings to those two different websites, the researcher subdivided the data to more detailed and specifically related to the five theories, which was used in the aesthetic website GUI design, and always compare those theories to the non-aesthetic website.

- Golden Section Theory

As golden section theory has been used on the height and width of the webpages, the user may not easily realize the differences of size between those two websites. However, there is a trend that users more likely to use the word "*comfortable*" to describe the layout of the aesthetic website. That is because the golden section provides the ratio of rectangle, which is the most visually pleased ratio to human eyes.

Compare to the non-aesthetic website, users just used the word "*uncomfortable*" since this website breaks down this principle, and that leads all other elements on the webpages display in a visual unpleasing position.

- Dynamic Symmetry Theory

Users prefer to use phrases "*very beautiful*", "*conventional*", "*clean and tidy*" to describe their feeling to the layout of the aesthetic website, since the elements are sized and positioned all based on dynamic symmetry.

But for the non-aesthetic website, users just show opposite attitude compare to the aesthetic one. They feel that, the layout is a mess and disordered and they think it does not like the normal website as they usually browse on the Internet. The reason for this situation is because most of the websites have partially for fully

adopted some of the aesthetic principles on its GUI design, so users may have a feeling that dynamic symmetry on webpages are normal and standard. For those who have not adopted this theory, they think it is just strange and un-normal.

- The Gestalt Laws

These laws are designed based on human habits on the distribution of elements in our daily life. So, the aesthetic website design by following those principles provide users also conventional feelings, they indicate that the aesthetic one is easier to find needed information and it is also easy to use. When users saw the list of buttons in a line, they subconsciously believe those buttons are belongs together and used as similar function. And the pictures in Gallery page, users feel that the distribution looks comfortable and clear, they can go through those pictures fast and accurately.

However, when they use another website, they feel buttons and pictures placed out of order and the position of buttons in that way was confusing him. Users also indicated that, this kind of GUI design makes them feel very unprofessional.

- The Colour Theories

The use of colours on GUI design plays an essential role on webpages, since it able to make the first impression to users, which determines whether users would like to stay longer on the website. For the non-aesthetic website, users feel uncomfortable and unsatisfied about the scheme of colours, those are illustrated by the coded phrases "*the colour scheme is killing my eyes*", "*Don't want to spend time on it*", "*Don't feel like to read the content*", "*Text is difficult to read*" and "*Don't want to use this website any more*". All those are lead by breaking down the colour theory of harmony and *Gestalt's* theory on text, since the combination of various hue colours on the website provides dizzy feelings to human eyes. Moreover, for colour blindness people, it is also hard for them to distinguish the text from its background colour so that they may have difficulties to read and use this website.

Whereas, the use of colour by following the colour theories provides clear, comfortable and beautiful to users, because the colour schema illustrates harmony with the background colours, which the colours are near each other on the colour wheel. And also, the text colour with its background colour by using Goethe's theory provides good contrast to human eyes. This rewards users satisfaction by showing their interest and they would like to visite this website in the future.

6 CONCLUSION

Aesthetics theories are widely adopted and accepted by human not only on architectures, paintings and nature beauty, but also suitable and appears excellence on website design.

People feel that, aesthetic website is more beautiful and easy to use, which shows great satisfaction from users. Base on this study, it confirmed five aesthetic principles, which are well adopted on Graphical User Interface and also achieved good affections from users.

Golden section and dynamic symmetry used on website layout design contract comfortable visual effect to human eyes. Gestalt laws used as the distribution and position of website elements on webpages provides clean, tidy and well-organized effect to users, they also feel easy to find information and accomplish a specific task. Colour theories used in selecting the colours on website provides nice visual effect and harmony to users.

Unlike another sample website, which have not applied any aesthetic rules. Users feel difficult to find information and read the text from the content since the combination of background and text colour are too similar to each other, that leads low contrast and usability to the website. The distribution of elements on the non-aesthetic website gives the user mess and unprofessional feeling and users admit that they even do not want spent more time on the webpages.

All in all, aesthetics theories structured a good graphical user interface on website design, and it shows easier and more clear guideline for user to find information from it.

7 DISCUSSION

7.1 Scope and Limitations

This research study focuses on finding out user's feelings about web interface design by applying aesthetic theories. It covers the design principles about screen layout design, element distribution and colour harmony on the website.

Due to the reason of limited time for the research, the researcher could only provide two websites for the research investigation, one aesthetic-based website and another non-aesthetic website and both websites are designed by the researcher. As the current development of websites, there is a large number of websites available on the Internet, that are used for different purposes and with various design styles. It is impossible for the researcher to show all kind of websites with different themes in her research, since developing a fully aesthetic based website and a non-aesthetic website for contrasting is time consuming.

In addition, another limitation in this study is the research people. All the investigation concerning this research is done inside Lahti University of Applied Sciences. Even though, the researcher tried to avoid collecting data from a similar group, there is still a limitation that the research could not cover all different level of education and age.

7.2 Reliability and Validity

For testing the quality of the research, reliability and validity are commonly used as the path for measurement. The definition of realiability and validity in qualitative research is: Firstly, the results of the research are replicable and retested, that can fulfill the reliability in the research. For example, in this research paper, if somebody adopted the aesthetic rules as mentioned in this paper, they should get similar results to this author's results. Secondly, for validity, it is measured for testing whether the research is accurate and process as it is intended to be (Golafshani, 2003).

Reliability in this research paper was measured by designing the aesthetic website

based on aesthetic theories, as well as breaking all those theories on a non-aesthetic website design. So, an obvious and clear comparison has been made for the research. After the preparation, interview investigations have been done in the author's home University. The interviewees were carefully selected from different Faculties in the University, and observing their behaviour when they browsed those two websites. After collecting all the needed information, the data was analysed by always checking and comparing the data to theories. All the sources were selected critically and the information was always up-to-date, so that the final results can be very reliable for similar adoption.

Validity in this research is measured by comparing the result with the research of others. A related study (Michailidou, Harper, & Bechhofer, 2008) about understanding user's visual and aesthetic sense showed that the appearance of a website effects the user interaction with the pages. Their results indicate that there is a strong connection between users' perception to the aesthetic appearance on webpages, "*Results show a strong and high correlation between users' perception of visual complexity, structural elements (links, images, words and sections) and aesthetic appearance (organisation, clearness, cleanliness, interestingness and beautifulness) of a Web page*".

Wang, et al. (2010) also claimed that "*web aesthetics has positive effects both on the intention to purchase and on the activation of search, and its effect on the activation of search is much stronger than its effect on the intention to purchase*". They also argued that aesthetics on webpages plays a substantial role for web shoppers' activities for information processing.

Chen (2009) assumed that aesthetics on a website can influence the factors such as attitude to company, credibility and motivation for online companies, so they suggest to build aesthetic interface websites on the Internet in order to show a personable and trustworthy face of the compamy.

Those related research results successfully supported the validity of this research. It was also achieved by careful analysis of all the sources and comparing them to the collected and analysed data.

7.3 Suggestions for Further Research

As mentioned in the limitations, there are two main points, which can be considered as suggestions for further research. One of them is that researchers could choose sample data more wisely. For example, researchers could choose 3-5 different types of aesthetic websites for research, and samples should be representative. Another suggestion is collecting data from different target groups such as selecting interviewees from different types of people by age, education, nationality and so on.

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APPENDICES

```
var mySong:Song = new Song();
var myChannel:SoundChannel = new SoundChannel();
var soundPosition:int = 0;

btnPlay.addEventListener(MouseEvent.MOUSE_UP, playSound);
btnPause.addEventListener(MouseEvent.MOUSE_UP, pauseSound);
btnStop.addEventListener(MouseEvent.MOUSE_UP, stopSound);

function playSound(event:MouseEvent):void
{
        myChannel = mySong.play(soundPosition);
}

function pauseSound(event:MouseEvent):void
{
        soundPosition = myChannel.position;
        myChannel.stop();
}

function stopSound(event:MouseEvent):void
{
        myChannel.stop();
}
```

Figure 19: Source code of music function

```
var targetX:int;
var targetY:int;
var leftBound:int;
var rightBound:int;
var topBound:int;
var bottomBound:int;
var boundary:int;
var leftEdgeOfStage:int = 0;
var rightEdgeOfStage:int = stage.stageWidth;
var topEdgeOfStage:int = 0;
var bottomEdgeOfStage:int = stage.stageHeight;
var leftOfBG:int;
var rightOfBG:int;
var topOfBG:int;
var bottomOfBG:int;
var bgSpeed:int = 6;
var threshold:Number = 0;

stage.addEventListener(MouseEvent.MOUSE_MOVE, mouseMove);
stage.addEventListener(Event.ENTER_FRAME, enterframe);

boundary = 130;
leftBound = boundary;
rightBound = stage.stageWidth - boundary;
topBound = boundary;
bottomBound = stage.stageHeight - boundary;

function mouseMove(event:MouseEvent):void
{
		targetX = stage.mouseX;
		targetY = stage.mouseY;
}
```

```
function enterframe(event:Event):void
{
		if (targetX < leftBound)
		{
				threshold = (leftBound - targetX)/100;
				leftOfBG = background.x - (background.width/2);

				if (leftOfBG < leftEdgeOfStage)
				{
						background.x += 
threshold*bgSpeed;
				}
		}
		if (targetX > rightBound)
		{
				threshold = Math.abs((rightBound - targetX)/100);
				rightOfBG = background.x + 
(background.width/2);
				if (rightOfBG > rightEdgeOfStage)
				{
						background.x -= threshold*bgSpeed;
				}
		}
```

Figure 20: Source code of moving background

```
btnHome.addEventListener(MouseEvent.CLICK, ShowHomePanel);
btnGallery.addEventListener(MouseEvent.CLICK, ShowGalleryPanel);
btnStory.addEventListener(MouseEvent.CLICK, ShowStoryPanel);

function ShowHomePanel(e:MouseEvent)
{
		infoPanelHome.gotoAndStop(2);
		infoPanelHome.gotoAndStop(3);
		infoPanelHome.gotoAndPlay(1);

}

function ShowGalleryPanel(e:MouseEvent)
{
		infoPanelHome.gotoAndStop(1);
		infoPanelHome.gotoAndStop(3);
		infoPanelHome.gotoAndPlay(2);
}

function ShowStoryPanel(e:MouseEvent)
{
		infoPanelHome.gotoAndStop(1);
		infoPanelHome.gotoAndStop(2);
		infoPanelHome.gotoAndPlay(3);
}
```

Figure 21: Source code of buttons